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ORIGINAL MEMOIRS

FATAL POST-OPERATIVE EMBOLISM.*

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INTRODUCTION.

THE plugging of vessels by foreign bodies floating in the blood stream was first brought to the attention of the medical world by Virchow, to whom, indeed, we owe practically the whole theory of embolism.

His studies, made principally from 1846 to 1856, were early confirmed by numerous clinical, experimental, and post-mortem observations by others, chief among whom should be mentioned Cohnheim and Cohn. Of the latter's work, published in 1860, Welch remarks: "It is extraordinarily rich in anatomical, experimental, and clinical facts, and it is well for any one who believes that he has a new observation or opinion concerning embolism to consult it before venturing on publication; a precaution which has evidently been often neglected by writers on the subject." When with Virchow's and Cohn's work we place Cohnheim's "*Studies on the Embolic Process,*" published in 1872, and Welch's classical review of "*Thrombosis and Em-*

* Presented before the Association of American Physicians, May, 16, 1912.

bolism," published in 1899, we have listed most of the significant literature on embolism.

It is therefore not with a hope of adding materially to any portion of the doctrine of embolism that I present the following data, but merely to place it on record that it may be used for statistical purposes in surgical prognosis, and as a basis for suggesting anew certain precautionary measures for the prevention of embolism.

ANALYSIS OF CASES.

From the opening of St. Mary's Hospital, Sept. 30, 1889, to Sept. 13, 1899, a period of ten years, I find no fatal case of post-operative embolism recorded in the annals of the hospital, and no sudden death which could reasonably be ascribed to such a cause, though during these ten years over 6,000 major operations were performed in the clinic.

From Sept. 13, 1899, to Dec. 31, 1911, 47 fatalities from post-operative embolism occurred. During this period of twelve and one-quarter years, approximately 57,000 major operations were performed.

Autopsies were made on 41 of the fatal cases, and the clinical diagnoses were quite positive in the remaining 6 cases. Within the same period it is true that a great many non-fatal cases of embolism were noted clinically with more or less positiveness, but the histories in many of these are too indefinite to warrant their tabulation along with the fatal cases, and a review of them is reserved for a later communication.

The cases have been grouped by years in Table I as follows:

The total number of deaths occurring in the hospital for the period under consideration, from all causes, was 864, of which the fatalities from embolism are approximately 5 per cent. The mortality from embolism, based on the 63,573 operations, is 0.07 of one per cent., or one death in every 1,352 operations. When the cases are grouped according to the anatomical re-

[2] Welch: Albutt's System of Medicine, 1899, vol. vii, pp. 155–285.

gions on which the preceding operation was done, they are found to be as follows:

After 1,372 operations on blood-vessels, 2 deaths, or 0.14 of 1 per cent.

After 3,266 operations on the thyroid, 2 deaths, or 0.06 of 1 per cent.

After 2,281 operations on the mouth, 1 death, or 0.05 of 1 per cent.

After 2,391 operations on the stomach or duodenum, 3 deaths, or 0.12 of 1 per cent.

After 4,597 operations on the gall-bladder, 9 deaths, or 0.19 of 1 per cent.

After 389 operations on the small intestine, 1 death, or 0.26 of 1 per cent.

After 9,908 operations on the appendix, 4 deaths, or 0.04 of 1 per cent.

After 2,530 operations on the colon and rectum, 5 deaths, or 0.20 of 1 per cent.

After 4,501 operations on hernia, 5 deaths, or 0.11 of 1 per cent.

After 900 operations on the kidney, 1 death, or 0.11 of 1 per cent.

After 601 operations on the prostate, 4 deaths, or 0.66 of 1 per cent.

After 7,993 operations on the uterus, tubes, and ovaries, 10 deaths, or 0.13 of 1 per cent.

Total, 40,449 operations, 47 deaths average 0.12 of 1 per cent.

No fatality from embolism occurred in any of the 1,346 operations on the breast, though a large share of these were extensive Halsted amputations. Neither did any fatal embolism follow any of the 449 vaginal hysterectomies, though there was one case in every 342 abdominal hysterectomies, that is, 5 in 1,712 cases.

The following are some of the salient facts shown in Table II:

Twenty-six of our patients were males and 21 females. The youngest was 25 years of age, the oldest 72, and the remaining cases were quite evenly distributed throughout the intervening decades.

Forty-one of the patients—all except 4 of the hernia cases and 2 of the appendix cases—had been from 2 to 35 years subject to some form of severe chronic debilitating disease. Speaking broadly, all these were very sick patients when operated upon, and, in the light of our present knowledge, the majority of them were probably the subjects of low-grade bacteræmias.

Nineteen of the fatalities occurred within the first week after operation, 21 more within the second week, 4 in the third week, and 1 each on the 26th, the 30th, and the 64th days, respectively. These latter three patients had all left the hospital and were well along in convalescence. In general, in marked contrast to the serious pre-operative conditions of these patients, it was noted that they were getting along remarkably well just prior to the occurrence of the fatal embolism. These patients, however, were not kept in bed either a materially greater or a materially less time than were other patients having the same type of operation.

In 36 of our cases the embolism was pulmonary, in 10 cerebral, and in 1 coronary. In 28 of the 41 cases posted the location of the originating thrombus was found in the field of operation or femoral vein. In 4 cases the emboli were found to have originated, in all probability, in the heart, and in the remaining 9 cases the source was undetermined. Arteriosclerosis was found in 5 cases, chronic myocarditis in 11, chronic nephritis in 14, and chronic hepatitis in 18. In 5 of the cases thorough post-mortem examination failed to show any considerable change in any tissue or organ except those incident to the healing of the wound and to the embolus itself.

SPECIAL INFERENCES FROM ABOVE CASES.

With this data before us, what inferences may be drawn therefrom? Why for the first ten years in the history of

the hospital, during which time 6,000 major operations were performed, were there no recognized deaths from embolism, while since that period one case in every 1,213 so terminated? Neither the surgeons, the anæsthetists, nor head nurses have been materially changed on the staff in that time, nor yet has their method of procedure been materially varied. The anæsthetic has been ether since the foundation of the hospital, and always it has been given in the smallest amount possible to maintain anæsthesia for only sufficient time to permit the rapid completion of the operation.

The only changes coincident with the increase are:

(*a*) In the nature of the operations. During the first ten years the number of operations on the stomach, gall-bladder, lower bowel and prostate, and of hysterectomies was small enough to come under the limit of probable fatality as measured by that of subsequent years. During the last twelve years a very high percentage of our operations has been on these organs, and it is subsequent to operations on these organs that most of our fatalities have occurred.

(*b*) The condition of the patient coming into the hospital and to the operating table has materially changed since the first decade of the hospital's history. During the first ten years of the clinic a very large proportion of the surgical cases were drawn from the general family practice of the members of the hospital staff and were operated on before they were *in extremis*. During the last twelve years, however, the surgical material has consisted almost entirely of referred cases, with an ever-increasing percentage of those of the "last resort" type, and it is in this class of cases in which most of the emboli have occurred.

GENERAL CONSIDERATIONS.

From a study of our own cases and of the literature of other observers, I desire to call attention to the following brief general considerations concerning the subject of post-operative embolism:

1. Following operations, particularly on the blood-vessels,

alimentary canal, and genito-urinary organs (both male and female), from 1 to 2 per cent. of all cases give more or less distinct clinical evidence of emboli, above 70 per cent. of which are in the lungs. Our own data in this regard have not yet been accurately tabulated, but they do not seem to give as high percentages as that from other clinics.

2. As nearly as can be observed from the incomplete and necessarily inaccurate data at hand, about 10 per cent. of post-operative emboli which give clinical symptoms of diagnostic significance cause sudden death.

3. Where post mortems are made on cases of fatal post-operative embolism, the source of the emboli can be definitely determined as venous thrombosis in about 80 per cent. of the cases, as cardiac thrombosis in 10 per cent. of the cases, while 10 per cent. are scattering or undeterminable.

4. Though there must be more or less formation of venous thrombi at the site of every extensive surgical operation, yet it is probable that the long, loosely-formed thrombi from medium-sized veins are those chiefly concerned in embolism, and especially in fatal embolism.

5. When large, loose thrombi are once formed in a resting patient, any unusual exertion or change of position may cause a dislocation of large masses which become dangerous emboli.

6. The most important factors concerned in extensive post-operative thrombosis are as follows:

(*a*) *Injury of the Vascular Walls.*—Rupture of the intima by cutting, ligating, or clamping causes a rapid deposit of a fibrinous thrombus, which, however, is normally confined to an area close to the injury. Over this the endothelium quickly extends, covering the thrombus within a few days. It is probable that such small terminal thrombi, when endothelial-covered, rarely, if ever, become dislocated and form emboli. There can be no question, however, but that the constantly-present small thrombi in injured vessels form a nidus for the subsequent development of large, loose thrombi through the activity of other factors.

(*b*) *Slowing and Stagnation of the Blood Stream.*—After

operations the rapidity and volume of the current in the veins are materially lessened for a considerable distance proximal to the first incoming venous radicles. Furthermore, the patient is usually kept quiet in a recumbent posture, thus reducing the force and rapidity of the heart's action and causing a general slowing of the blood current throughout the entire vascular system, including the heart. When the blood stream is slower or when a part of the vascular system is incompletely filled, a disarrangement of the blood-cells occurs, the white cells and platelets reaching the periphery of the stream and tending to attach themselves to the vascular walls. In addition to this, in the presence of obstacles or marked expansions, a whirling motion, as pointed out by von Recklinghausen, may be set up which further tends to the retardation of the blood stream and to the deposition of its elements as thrombi.

(*c*) *Disintegration of the Corpuscles of the Blood from Toxic Substances.*—While such toxic substances are not definitely known, their presence is assumed from their apparent action in the severe secondary anæmias and hepatic diseases. It has been suggested that this factor may account for the high percentage of post-operative emboli following operations on the gall-bladder. It has also been suggested that toxic substances reaching the circulation from extensive carcinomas may in this manner cause marked post-operative thrombosis. In this connection, however, we must not forget the rarity of post-operative emboli following extensive operations for mammary carcinomas.

(*d*) *Bacteræmia.*—That bacteria and their toxins are the chief causes of extensive post-operative thrombosis, as well as thrombosis occurring in the course of infectious diseases, is now fairly well established. By no means all post-operative thrombi occur in the field of operation. Phlebitis and a resulting thrombus are all too frequent. The last decade has seen a very marked extension of our knowledge of the frequent infection of the blood stream by bacteria. This is particularly so in chronic diseases with local infection. It is readily conceivable that bacteria within the blood stream may have their virulence

sufficiently reduced to prevent their setting up a local phlebitis until aided by operative traumatism of the intima, post-operative slowing of the blood current, or, perhaps, even the effect on the leucocytes of a prolonged general anæsthetic. Certain it is that many thrombi, which we were formerly wont to regard as "marantic," we have now come to know are of infective origin. In this connection the post-operative formation of cardiac thrombi (and therefrom pulmonary or cerebral emboli) on small areas of endocarditis is worthy of note. When a polypoid thrombus has been swept off from the wall of the heart its remaining ragged base may be overlooked without the most careful search at autopsy. While emboli from such a source are by no means common, the possibility of their occurrence must not be forgotten.

7. The above-mentioned factors must determine whatever precautionary measures may be taken for the prevention of post-operative thrombosis and embolism. The following suggest themselves:

(*a*) *The reduction of vascular traumatism to a minimum* at operation by the conservative occlusion of vessels, and the provision of free drainage to prevent later extensive external pressure on vessels.

(*b*) *The encouragement of very early free movement on the part of the patient* as soon as the nature of the operation and danger from hemorrhage will permit, though it must be confessed that the reported results from various clinics of "getting the patient up early" are unconvincing as to the reduction of post-operative embolism. If it can be done early enough to *prevent* the formation of extensive thrombi, it would seem to be most desirable. If, on the other hand, the condition of the patient's blood, either from anæmia or bacteræmia, is such as to lead to the suspicion that extensive thrombi *may have already been formed* before it is possible to permit free movement on the part of the patient, it would then seem the part of wisdom to keep the patient as quietly as possible in a recumbent position to prevent the dislocation of the already formed thrombi. All of the surgeon's judgment may be

TABLE I, SHOWING TOTAL OPERATIONS, DEATHS, ETC., COMPARED WITH DEATHS FROM EMBOLISM, ST. MARY'S HOSPITAL, SEPT. 30, 1889, TO JAN. 1, 1912.

Region	1889 to 1893		1894		1895		1896		1897		1898		1899		1900		1901		1902		1903		1904		1905		1906		1907		1908		1909		1
	Operations	Deaths from Embolism.	Operations	Deaths from Embolism.	Operations	Deaths from Embolism.	Operations	Deaths from Embolism.	Operations	Deaths from Embolism.	Operations	Deaths from Embolism.	Operations	Deaths from Embolism.	Operations	Deaths from Embolism.	Operations	Deaths from Embolism.	Operations	Deaths from Embolism.	Operations	Deaths from Embolism.	Operations	Deaths from Embolism.	Operations	Deaths from Embolism.	Operations	Deaths from Embolism.	Operations	Deaths from Embolism.	Operations	Deaths from Embolism.	Operations	Deaths from Embolism.	Operations
Vessels	11	..	...	..	2	..	5	..	22	..	22	..	43	..	57	..	61	..	65	..	70	..	87	..	80	..	132	..	129	..	131	1	164	..	15
Thorax and lungs	...	..	1	..	10	..	1	..	4	..	13	..	12	..	12	..	15	..	16	..	14	..	26	..	21	..	28	..	31	..	36	..	35	..	5
Thyroid	...	..	...	..	...	..	3	..	6	..	4	..	..	..	10	..	3	..	18	..	34	..	31	..	36	..	135	..	247	1	439	..	551	1	70
Mouth	38	..	5	..	18	..	25	..	34	..	38	..	20	..	30	..	24	..	36	..	33	..	95	..	147	..	138	..	234	..	252	..	318	..	42
Stomach and duodenum	9	..	2	..	1	..	4	..	11	..	12	..	16	..	26	..	59	..	77	..	139	..	171	..	217	..	214	1	190	..	232	..	272	..	33
Gall-bladder and liver	9	..	3	..	10	..	21	..	15	..	20	..	33	..	76	..	107	..	149	..	217	1	308	2	329	..	385	..	444	1	528	2	589	2	65
Small intestine	2	..	...	..	7	..	3	..	2	..	4	..	10	..	7	..	14	..	15	..	21	..	18	..	7	..	11	..	35	..	27	..	38	..	6
Appendix	9	..	10	..	11	..	24	..	43	..	50	..	96	..	183	..	303	1	345	..	404	..	536	..	766	1	928	..	1151	..	1344	..	1334	..	117
Colon and rectum	21	..	46	..	34	..	41	..	62	..	69	..	82	..	90	..	101	..	119	..	97	..	118	..	142	..	196	..	214	2	238	1	260	1	26
Hernia	9	..	6	..	17	..	32	..	42	..	43	..	76	..	74	..	128	..	150	..	172	..	206	1	294	..	420	1	556	1	636	2	524	..	59
Kidney	4	..	5	..	11	..	9	..	12	..	16	..	22	..	22	..	26	..	34	..	35	..	37	..	50	..	73	..	76	1	85	..	107	..	13
Urinary bladder	5	..	2	..	4	..	1	..	5	..	5	..	9	..	9	..	4	..	16	..	13	..	9	..	29	..	46	..	17	..	32	..	41	..	4
Prostate	...	..	...	..	...	..	1	..	..	..	...	..	..	..	..	..	...	..	6	..	29	..	27	..	63	..	42	..	67	1	86	..	82	..	8
Breast	18	..	8	..	11	..	14	..	11	..	16	..	28	..	35	..	36	..	41	..	37	..	48	..	84	..	98	..	102	..	148	..	202	..	21
Uterus, tubes and ovaries	58	..	73	..	34	..	112	..	179	..	156	..	303	1	312	..	324	1	287	..	360	..	454	1	514	..	720	..	755	2	663	..	806	..	96
Totals	193	..	161	..	170	..	298	..	448	..	468	..	750	1	943	..	1205	2	1374	..	1675	1	2171	4	2779	1	3566	2	4248	9	4877	6	5323	4	587
Abdominal hysterectomy	5	..	4	..	13	..	12	..	15	..	31	..	39	..	34	..	31	1	51	..	58	..	79	1	97	..	130	..	175	..	173	..	240	..	25
Vaginal hysterectomy	...	..	...	..	...	..	14	..	8	..	9	..	12	..	17	..	13	..	11	..	17	..	7	..	30	..	49	..	58	..	51	..	41	..	5
Total abdominal operations	86	..	57	..	111	..	196	..	251	..	322	..	470	..	612	..	841	..	1074	..	1302	..	1788	..	2157	..	2750	..	3215	..	3647	..	5079	..	399
Total operations	1075	..	537	..	606	..	877	..	783	..	973	..	1644	..	1713	..	2124	..	2420	..	2640	..	3131	..	3836	..	4770	..	5553	..	6451	..	7177	..	821
Total deaths	15	..	1	..	5	..	6	..	10	..	12	..	13	..	21	..	27	..	32	..	69	..	62	..	64	..	69	..	81	..	86	..	83	..	1

OPERATIONS, DEATHS, ETC., COMPARED WITH DEATHS FROM EMBOLISM, ST. MARY'S HOSPITAL. SEPT. 30, 1889, TO JAN. 1, 1912.

1896		1897		1898		1899		1900		1901		1902		1903		1904		1905		1906		1907		1908		1909		1910		1911		Totals	
Operations	Deaths from Embolism.	Operations	Deaths from Embolism.	Operations	Deaths from Embolism.	Operations	Deaths from Embolism.	Operations	Deaths from Embolism.	Operations	Deaths from Embolism.	Operations	Deaths from Embolism.	Operations	Deaths from Embolism.	Operations	Deaths from Embolism.	Operations	Deaths from Embolism.	Operations	Deaths from Embolism.	Operations	Deaths from Embolism.	Operations	Deaths from Embolism.	Operations	Deaths from Embolism.	Operations	Deaths from Embolism.	Operations	Deaths from Embolism.	Operations	Deaths from Embolism.
5	..	22	..	22	..	43	..	57	..	61	..	65	..	70	..	87	..	80	..	132	..	129	..	131	1	164	..	159	..	132	1	1372	2
1	..	4	..	13	..	12	..	12	..	15	..	16	..	14	..	26	..	21	..	28	..	31	..	36	..	35	..	50	..	52	..	377	..
3	..	6	..	4	..	..	..	10	..	3	..	18	..	34	..	31	..	36	..	135	..	247	1	439	..	551	1	702	..	1047	..	3266	2
15	..	34	..	38	..	20	..	30	..	24	..	36	..	33	..	95	..	147	..	138	..	234	..	252	..	318	..	428	..	358	1	2281	1
4	..	11	..	12	..	16	..	26	..	59	..	77	..	139	..	171	..	217	..	214	1	190	..	232	..	272	..	336	1	403	1	2391	3
11	..	15	..	20	..	33	..	76	..	107	..	149	..	217	1	308	2	329	..	385	..	444	1	528	2	589	2	654	1	700	..	4597	9
5	..	2	..	4	..	10	..	7	..	14	..	15	..	21	..	18	..	7	..	11	..	35	..	27	..	38	..	67	1	99	..	389	1
34	..	43	..	50	..	96	..	183	..	303	1	345	..	404	..	536	..	766	1	928	..	1151	..	1344	..	1334	..	1174	1	1197	1	9908	4
41	..	62	..	69	..	82	..	90	..	101	..	119	..	97	..	118	..	142	..	196	..	214	2	238	1	260	1	269	1	331	..	2530	5
32	..	42	..	43	..	76	..	74	..	128	..	150	..	172	..	206	1	294	..	420	1	556	1	636	2	524	..	594	..	522	..	4501	5
9	..	12	..	16	..	22	..	22	..	26	..	34	..	35	..	37	..	50	..	73	..	76	1	85	..	107	..	132	..	144	..	900	1
1	..	5	..	5	..	9	..	9	..	4	..	16	..	13	..	9	..	29	..	46	..	17	..	32	..	41	..	46	..	66	..	359	..
1	..	..	..	....	..	..	..	..	..	....	..	6	..	23	..	27	..	63	..	42	..	67	1	86	..	82	..	87	2	111	1	601	4
14	..	11	..	16	..	28	..	35	..	36	..	41	..	37	..	48	..	84	..	98	..	102	..	148	..	202	..	212	..	197	..	1346	..
2	..	179	..	156	..	303	1	312	..	324	1	287	..	360	..	454	1	514	..	720	..	755	2	663	..	806	..	967	2	916	3	7993	10
28	..	448	..	468	..	750	1	943	..	1205	2	1374	..	1675	1	2171	4	2779	1	3566	2	4248	9	4877	6	5323	4	5877	9	6275	8	42811	47
8	..	15	..	31	..	39	..	34	..	31	1	51	..	58	..	79	1	97	..	130	..	175	..	173	..	240	..	257	2	268	1	1712	5
1	..	8	..	9	..	12	..	17	..	13	..	11	..	17	..	7	..	30	..	49	..	58	..	51	..	41	..	57	..	55	..	449	..
5	..	251	..	322	..	470	..	612	..	841	..	1074	..	1302	..	1788	..	2157	..	2750	..	3215	..	3647	..	5079	..	3990	..	4266	..	32174	..
7	..	783	..	973	..	1644	..	1713	..	2124	..	2420	..	2640	..	3131	..	3836	..	4770	..	5553	..	6451	..	7177	..	8218	..	8745	..	63573	..
6	..	10	..	12	..	13	..	21	..	27	..	32	..	69	..	62	..	64	..	69	..	81	..	86	..	83	..	108	..	100	..	864	..

TABLE 2.—CASES OF FATAL POST-OPERATIVE EMBOLISM, ST. MARY'S HOSP

Office No.	Hospital No.	Name.	Sex	Age	Civil state.	Time sick.	Urine.	Operation.	Date	Significant
								Operations on Vessels.		
A3876	24381	J. B.	M	58	Wid.		Neg.	Ligation subclavian artery for aneurism	1-4-1908	
A 56079		F. T.	M	54	Wid.	15 yrs.	Neg.	Phlebectomy. Varicose veins left leg	7-20-1911	Normal temp
								Operations on Thyroid.		
A776	23048	C. O. S.	F	37	Mar.	16 yrs.	Neg.	Thyroidectomy, exophthalmic goitre	8-21-1907	Pulse before
29528		R. B. W.	M	55	Mar.	25 yrs.	1500 cc. in 24hs. 1015	Thyroidectomy, enucleation multiple cysts of left lobe of thyroid.	10-4-1909	
								Operations on Mouth.		
A 50247	39894	G. P.	M	67	Mar.	5 mo.	Neg.	Excision cervical glands and anterior jugular veins for carcinoma tongue.	3-15-1911	Temperature 80, 100, 90
								Operations on Stomach.		
A 18974		B. B.	M	41	Mar.	20 yrs.	Neg.	Gastro-enterostomy large ulcer duodenum. Secondary appendectomy.	10-13-1910	Tempt. 103, eighth. P
7968		M. G. M.	M	66	Mar.	8 mo.	Neg.	Gastro-enterostomy chronic perforating ulcers of duodenum.	9-12-1906	
50487		M. R.	M	47	Mar.	1 yr.	Albumen.	Exploration stomach for carcinoma (inoperable).	3-15-1911	No significan
								Operations on Liver and Gall-B		
2189		W. T. B.	M	48	Mar.	27 yrs.	Neg.	Cholecystostomy. Secondary appendectomy	6-23-1907	No significan
A 9932	26036	G. G.	F	36	Single	6-8 yrs.	Neg.	Cholecystostomy, cholecystectomy, fibroid uterus.	5-27-1908	No significan
1545		W. H. L.	F	30	Mar.	Several yrs		Cholecystostomy, stones in gall-bladder	8-8-1904	None till sud
1368G.		B. S.	F	..	Single	3 yrs.	Neg.	Cholecystectomy, gall-stones, 10 stones in gall-bladder.	6-4-1903	None till sud
A 20890	29499	H. T.	F	57	Mar. 40 yrs.	9 to 10 yr.	Neg.	Cholecystostomy, stones in G. B., 3 in cystic duct.	3-16-1909	None till sud
A 7738.	25259	H. T.	F	35	Mar. 17 yrs.	5 yrs.	Neg.	Cholecystostomy, one large stone in gall-bladder.	3-13-1908	None till sud
A46474	38394	J. W.	F	43	Mar.	12 yrs.	Neg.	Cholecystostomy, stones in G. B., cystic duct cut.	12-8-1910	Temperature day). Pul
1127		C. E. W.	F	33	Mar.	6 yrs.	Neg.	Gall-bladder	6-20-1904	None till suc
A3664.		E. Z.	M	60	Mar.	35 yrs.	Trace alb.	Cholecystostomy, many stones in gall-bladder	11-15-1907	None till suc
								Operations on Small Intesti		
A 38550	35711	J. F. H.	M	57	Mar.	3 yrs.	Neg.	Amputation diverticulum	6-14-1910	
								Operations on Appendix.		
958J		W. P.	M	25	Single	1 wk.	Neg.	Large appendiceal abscess with stone, 8 day, draining.	11-1-1905	Peritonitis.
A 41747		H. S.	M	35	Mar.	2 yrs.	Neg.	Drain of abscess. Appendix not removed	8-12-1910	Tempt. 103 100 3rd da
		W. S.	M	31	Mar.	2 yrs.	Neg.	Appendectomy. Acute appendicitis	1-10-1901	None till suc
58714		G. E. V. A.	M	30	Mar.	2 da.	Neg.	Acute appendicitis	9-12-1911	Normal 3rd subnormal
								Operations on Colon and Rec		
9663G.		R. D.	F	29	Single	10 or 12 yrs.	Neg.	Kraske for cancer rectum. 5 inches intestine removed.	4-27-1907	No significa
37405	35351	M. D.	M	..		2 yrs.	Neg.	Carcinoma rectum	5-19-1910	Early in con
A 13039	30438	J. J.	M	58		2 yrs.	Neg.	Resection of sigmoid	5-26-1909	
A 14596	27300	H. L. L.	M	52	Mar.	6 mo.	Neg.	Resection splenic flexure, lateral anastomosis	9-11-1908	None till suc
								Operations on Herniæ.		
A 1396.	29532	B. L. A.	F	38	Mar.	11 yrs.	Neg.	Cholecystostomy, umbilical hernia, herniotomy.	3-17-1909	Tempt. afte to 104. Pu
A 7855.	25269	H. B.	M	37	Mar.	1 yr.	Neg.	Right inguinal direct hernia, herniotomy	3-23-1908	None till su
A 10617	26150	S. J.	M	57	Mar.	1 yr.	Neg.	Herniotomy, right inguinal hernia. Cord displaced.	6-6-1908	None till suc
1209M		W. K.	M	63	Mar.	2 yrs.	Neg.	Removed double cyst of epididymis. Double hydrocele and inguinal hernia.	7-20-1904	None till suc
1379J		L. K.	M	61	Mar.	8 yrs.	Neg.	Herniotomy, double inguinal hernia, large direct.	5-3-1906	None till suc
3099		J. W.	M	65	Mar.	12 yrs.	Neg.	Herniotomy, large, direct inguinal hernia	10-25-1907	Tempt. 26th 101, 99, 1
								Operations on Kidney.		
A9828	26184	C. D. M.	F	45	Mar.	13 yrs.	Neg.	Tumor right kidney, pyonephrosis	6-9-1908	None till suc
								Operations on Prostate.		
A2803	23631	J. B.	M	25		25 yrs.	Albumen.	Perineal prostatectomy for large prostate	10-21-1907	None till su
A 38191		J. C. L.	M	65	Single	4 yrs.	Trace alb.	Suprapubic prostatectomy, hypertrophied prostate	4-15-1911	Temperatur
A 35217	37529	P. M.	M	72	Mar.	20 yrs.	Some alb.	Suprapubic prostatectomy, catheter left in urethra.	10-12-1910	
A 37447	35407	J. J. M.	M	66	Wid.	10 yrs.	Some alb.	Suprapubic prostatectomy, hypertrophied prostate	5-23-1910	None till su
								Operations on Uterus, Tubes, and		
		R. B. C.	F	42	Mar.	2 yrs.	Neg.	Supravaginal hysterectomy for fibroids	10-25-1901	
		S. C.	F	51	Mar.	8 yrs.	Neg.	Repair of lacerated cervix	9-13-1899	None till su
3690G.		E. A. C.	F	47	Mar.	2 yrs.	Albumen.	Hysterectomy for carcinoma of uterus	8-10-1904	None till su
37821		J. G.	F	43	Mar.	7 wks.	Alb.+sugar	Total abdominal hysterectomy	5-25-1910	None till su
A 35866		J. H.	F	45	Mar.	9 mo.	Neg.	Subtotal abdominal hysterectomy, left ovary and tube removed.	4-2-1910	101 5th day Pulse, 90 then 76 t
A1451.	23192	A. McK.	F	41	Mar.	10 mo.	Some alb.	Exploration of abdomen for carcinoma uterus	9-4-1907	None till su
48404	39237	P. E. R.	F	44	Mar.	3 yrs.	Neg.	Abdominal hysterectomy for degenerating fibroids.	2-3-1911	
9802G.		J. S.	F	50	Mar.	2 yrs.	Neg.	Laparotomy for removal of ovarian cyst	5-28-1907	None till su
A 58996	42967	R. T.	F	29	Mar.	9 mo.	Neg.	Laparotomy for removal of right tube	9-26-1911	Tempt. 101 as low as
A 53176		M. W.	F	57	Wid.	6 mo.	Trace of albumen.	Watkins-Wertheim and phlebectomy. Varicose veins left leg.	5-23-1911	Temperatur to 90.

Significant post-operative symptoms.	Date of death.	Days after operation.	Clinical cause of death.	Autopsy cause of death.	Total operations from region.	Total deaths from embolism.	Percentage deaths of cases.
ON VESSELS.							
.....	1-6-1908	2	Embolism.....	Cerebral embolism...	....	..	....
Normal temperature and pulse after 6 days.	7-29-1911	9	Embolism.....	Pulmonary embolism.	1372	2	0.14
ON THYROID.							
Pulse before operation 140.....	8-25-1907	4	Cerebral embolism...	Cerebral embolism...	....	..	....
.....	10-5-1909	1	Pulmonary embolism.	Pulmonary embolism.	3266	2	0.06
ON MOUTH.							
Temperature 98 to 99 first 5 days. Pulse 80, 100, 90 to 125.	3-20-1911	6	Pulmonary embolism.	Embolism pulmonary artery.	2281	1	0.05
ON STOMACH.							
Tempt. 103.5 on fourth day; normal eighth. Pulse 140, 4th, 95 on 7th.	10-23-1910	10	Pulmonary embolism.	Autopsy refused.....	....	..	....
.....	9-13-1906	1	Pulmonary embolism.	Embolism coronary artery.	....	..	....
No significant till sudden death.....	3-26-1911	12	Pulmonary embolus..	Autopsy refused.....	2391	3	0.12
AND GALL-BLADDER.							
No significant.....	7-12-1907	10	Pulmonary embolism.	Pulmonary embolism.	....	..	....
No significant till sudden death.....	6-4-1908	8	Pulmonary embolism.	Autopsy refused.....	....	..	....
None till sudden death.....	8-23-1904	15	Pulmonary embolism.	Pulmonary embolism.	....	..	....
None till sudden death	6-9-1903	5	Pulmonary embolism.	Pulmonary embolism.	....	..	....
None till sudden death.....	3-25-1909	9	Pulmonary embolism.	Pulmonary embolism.	....	..	....
None till sudden death.....	3-29-1908	8	Pulmonary embolism.	Pulmonary embolism.	....	..	....
Temperature 98.6 to 100 (2nd to 11th day). Pulse 70 to 85.	12-18-1910	12	Embolism.....	Double pulmonary embolism.	....	..	....
None till sudden death.....	7-3-1904	14	Embolism.....	Cerebral embolism...	....	..	....
None till sudden death.....	11-23-1907	8	Pulmonary embolism.	Autopsy refused.....	4597	9	0.19
MALL INTESTINE.							
.....	6-14-1910	..	Cerebral embolism...	Cerebral embolism...	389	1	0.26
N APPENDIX.							
Peritonitis.....	11-6-1905	5	Peritonitis.....	Pulmonary embolism.	....	..	....
Tempt. 103 to 99 on 2nd day, 99 and 100 3rd day. Pulse 120-100.	8-14-1910	2	Pulmonary embolism.	Pulmonary embolism.	....	..	....
None till sudden death.....	1-18-1901	8	Pulmonary embolism.	Pulmonary embolism.	....	..	....
Normal 3rd to 8th days, then normal or subnormal. Pulse 60 after 2nd.	9-20-1911	8	Pulmonary embolism.	Pulmonary embolism.	9908	4	0.04
LON AND RECTUM.							
No significant till sudden death.....	5-13-1907	17	Pulmonary embolism.	Pulmonary and cardiac embolism	....	..	....
Early in convalescence peritonitis.....	6-18-1910	30	Cerebral embolism...	Cerebral embolism...	....	..	....
.....	5-27-1909	1	Pulmonary embolism.	Pulmonary embolism.	....	..	....
None till sudden death.....	9-19-1908	8	Cerebral embolism...	Cerebral embolus....	2530	5	0.20
ON HERNIÆ.							
Tempt. after 2 wks. 102 to 100, then 103 to 104. Pulse after 2 wks. 110, 100 to 120.	4-5-1909	19	Cerebral embolism...	Cerebral and pulmonary embolism	....	..	....
None till sudden death.....	5-1-1908	9	?	Pulmonary embolism.	....	..	....
None till sudden death.....	6-9-1908	3	Pulmonary embolism.	Pulmonary embolism.	....	..	....
None till sudden death.....	7-27-1904	7	Pulmonary embolism.	Pulmonary embolism.	....	..	....
None till sudden death.....	5-15-1906	12	Pulmonary embolism.	No autopsy.....	....	..	....
Tempt. 26th to 31st days 98, 99, 101, 99, 101, 99, 100, normal. Pulse always 84.	10-31-1907	6	Pulmonary embolism.	Pulmonary embolism.	4501	5	0.11
ON KIDNEY.							
None till sudden death.....	6-21-1908	12	Pulmonary embolism.	Pulmonary embolism.	900	1	0.11
ON PROSTATE.							
None till sudden death.....	10-22-1907	1	Cerebral embolism...	Shock or cerebral embolism	....	..	....
Temperature and pulse normal first 31 days	6-18-1911	64	Pulmonary embolism.	Right pulmonary embolism	....	..	....
.....	10-14-1910	2	Pulmonary embolism.	Pulmonary embolism.	....	..	....
None till sudden death.....	6-1-1910	10	Pulmonary embolism.	Pulmonary embolism.	601	4	0.66
, TUBES, AND OVARIES.							
.....	10-27-1901	3	Pulmonary embolism.	No autopsy.....	....	..	....
None till sudden death.....	10-9-1899	26	Pulmonary embolism.	Pulmonary embolism.	....	..	....
None till sudden death.....	8-22-1904	12	Pulmonary embolism.	Pulmonary embolism.	....	..	....
None till sudden death.....	6-1-1910	8	Pulmonary embolism.	Pulmonary embolism.	....	..	....
101 5th day, 98.6 on 8th and 9th days. Pulse, 90 to 96 on 8th and 9th days, then 76 to 80.	4-10-1910	8	Pulmonary embolism.	Pulmonary embolism.	....	..	....
None till sudden death.....	9-10-1907	6	Pulmonary embolism.	Pulmonary embolism.	....	..	....
.....	2-5-1911	3	Cerebral embolism...	Cerebral embolism...	....	..	....
None till sudden death.....	6-3-1907	6	Cerebral embolism...	Cerebral embolism...	....	..	....
Tempt. 101, 99 to 100. Pulse 90 to 100, as low as 70 3rd day.	10-3-1911	8	Pulmonary embolism.	Pulmonary embolism.	....	..	....
Temperature 98 to 100. Pulse from 80 to 90.	6-12-1911	20	Pulmonary embolism.	Right pulmonary embolism	7993	10	0.13

needed, and even then be at fault, in thus steering between the Scylla and Charybdis of " getting the patient up early " or " letting him have a long rest in bed." Either may be the worse thing or the better thing for the patient according to whether extensive thrombi have or have not formed. So far as I know, we have not yet sufficient data on which to base an accurate estimate of the time required in a given case for the formation of extensive post-operative thrombi. We do know, however, that such large, loose thrombi, once formed, are readily dislocated by a relatively slight exertion on the part of the patient.

(*c*) *The pre-operative administration of drugs to increase the coagulability of the blood,* as, for example, calcium salts in hepatic disturbances, is of questionable value, so far as thrombosis and embolism are concerned. It has not yet been shown that the presence of calcium salts in the blood renders it less liable to form thromboses, though it may be true that their presence induces the formation of a more dense clot.

(*d*) *Measures looking toward the reduction of bacteræmia* are certainly indicated as a pre-operative precaution for the prevention of thrombosis and embolism. Where possible, the preliminary destruction (as with a cautery) of local foci of infection should be considered. When the invading organism can be isolated and identified, a preliminary vaccination is suggested. Indeed, it is probable that in some instances such a preliminary vaccination might prove of material benefit to the patient in avoiding post-operative infections other than those of the vascular system.

ACUTE UNILATERAL HÆMATOGENOUS INFECTIONS OF THE KIDNEY.*

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SUPPURATION within the kidney parenchyma results from infection by one or another of certain varieties of micro-organisms taking place in one or two ways, either as an ascending infective process from the lower urinary tract or from the blood stream.

As ascending kidney infection is not the subject under consideration, this matter may be dismissed by the simple statement of fact that such ascending infection of the kidney never takes place unless there is some defect in the mechanism of the ureteral orifice which may permit of a reflux of infectious bladder urine into the ureter and kidney.

The acute renal infections of hæmatogenous origin are of two distinct classes: one induced by infective or toxæmic conditions; for example, nearly all of the infections which give rise to general diseases, such as diphtheria, scarlet fever, measles, smallpox, pneumonia, typhoid fever, and other acute general infections. The disturbance within the kidney is due in this class to the action of toxic substances elaborated by the virus of the special disease and which is in part eliminated through the kidneys. While the toxic substances of these acute general diseases conveyed to the kidney by the blood streams do induce cellular necrosis, it is rare that suppuration occurs, and the resulting kidney disturbances remain medical rather than surgical.

It is the second rather smaller, yet more serious, class of kidney infection of hæmatogenous origin whereby the kidney

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is invaded by the microörganisms themselves, resulting in acute inflammation and suppuration, that commands our attention from a surgical stand-point.

Acute suppurative nephritis of hæmatogenous origin is a condition resulting from the invasion of the kidney by certain microörganisms, in particular by the pyogenic cocci and the colon bacillus. It is theoretically of a metastatic nature, and when encountered in both kidneys is usually consecutive to septic endocarditis or other specific affections elsewhere in the body. When it occurs in but one of the two kidneys the primary focus from which the organisms find their way to the kidney has seldom been determined.

The pathology of acute unilateral hæmatogenous infections of the kidney is quite different from the acute bilateral kidney infections. The latter is an expression of a general septicæmia or pyæmia in which the kidneys may participate. The former, the acute unilateral kidney infections of hæmatogenous origin, is not a part of general pyæmia, but finds its origin in the lodging of a minute embolus carrying one or several organisms alone in the terminal vessels of the kidney. It is probable that as a rule the process is started by a single microörganism. The condition starts not by multiple simultaneous infections throughout the kidney, as the lesions observed in the kidneys removed at operation might suggest, but as a single focus in the cortex of the organ. When the organisms settle in the minute capillary vessels of the glomerulus, an inflammatory reaction is set up around the glomerulus and the surrounding tissue is infiltrated with the products of inflammation. From the primary focus of infection other areas are secondarily involved by the infectious material gaining access to other tubules, to the lymph-spaces and through the vessels in the connective-tissue stroma. The infection thus is more or less rapidly spread through these channels to other parts of the organ.

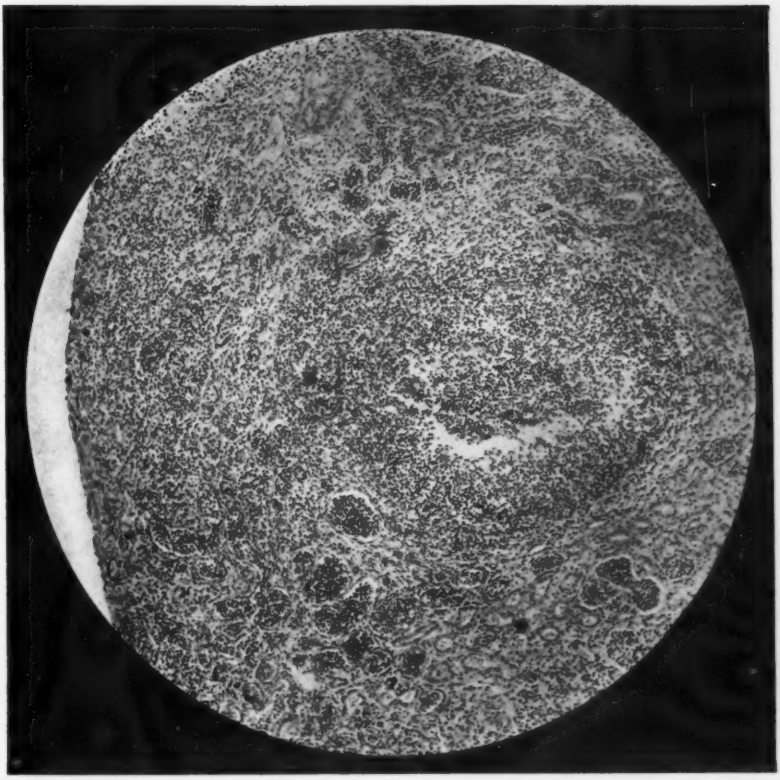
The pathological process originating as above described is of two distinct types: 1. *Abscess formation.* 2. *A diffuse inflammatory process without breaking down of tissue.*

In the former type of the disease, *abscess formation,* the kidney is found somewhat enlarged from congestion, and disseminated through its substance are small separate foci of suppuration or miliary abscesses surrounded by areas of congestion. In the early stages of this disease these minute abscesses are often observed in the cortex just beneath the capsule. From here other parts of the organ are secondarily involved, as just mentioned. If the process continues, these foci may enlarge, coalesce and form abscesses of larger size which may rupture the kidney capsule, invade the perirenal fat, resulting in a perinephritic abscess. For the infection to complete this cycle the resistance of the individual must be great and the virulence of the infecting organism comparatively slight, as the systemic toxæmia from this disease is rapid, and death usually occurs before the process develops to this stage. The organisms producing this form of kidney inflammation are the pyogenic cocci, the *Staphylococcus pyogenes albus* and *aureus,* and the *Streptococcus pyogenes.*

The histology of the condition is seen in Fig. 1.

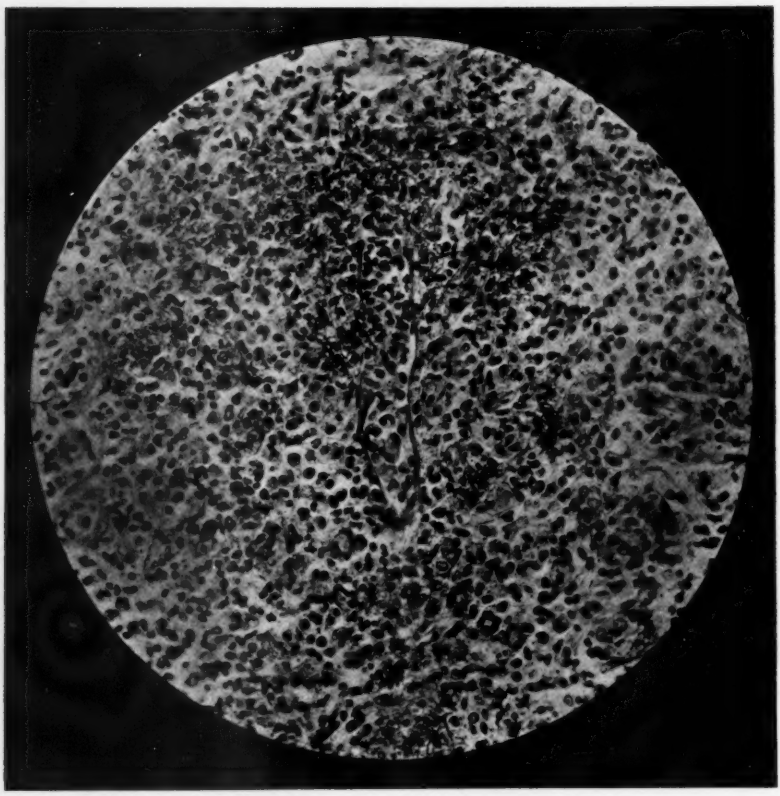
The second type of the disease, a *diffuse inflammatory process,* spreading through the kidney substance, but not resulting in focal abscesses or solution of tissue, has the same sequence of events in its pathology when of hæmatogenous origin. This type of the disease presents a pathology more commonly the result of an ascending infection, but is encountered as a process of hæmatogenous origin and results not from an infection of the organ by the pyogenic cocci, as does the abscess type, but by the colon bacillus. The difference in the severity of the process depends upon the lesser virulence of the infecting organism. The organ is found to be enlarged from congestion. There may be subcapsular areas of more or less acute reddening, and on section the organ is found to present irregular, circumscribed, acutely reddened or pale-yellowish areas involving the cortex and pyramids, or involving nearly the whole organ, but without solution of tissue. In the early stage of the process these isolated areas are distinct and are seen as irregular, acutely reddened patches, with the edges

FIG 1



Acute inflammation of the kidney, with abscess formation. Note miliary abscess tubules filled with polymorphonuclear leucocytes.

FIG. 2.



Acute inflammation of the kidney of diffuse type. Due to colon bacillus. Note that the lesions consist of inflammatory exudation, endothelial leucocytes with considerable fibrin formation, and few polymorphonuclear leucocytes. The exudation is both in the tubular and between them. There is no tissue solution.

streaked downward into the pyramids. As the inflammatory process subsides, these areas lose the acute red color and are replaced by tissue of a paler character. In some instances the whole kidney may present an acutely reddened surface, due to the acute process involving the whole organ. This form of the disease undergoes resolution without focal degeneration of tissues, and when seen after the acute process has subsided, presents paler areas, dependent upon the stage of the connective-tissue repair process. The histology of the condition in the acute stage of this type of the disease is seen in Fig. 2.

By studying the clinical course of these two forms of the disease, it becomes evident that the clinical signs differ in some respects, and each has definite relation with these two different pathological conditions. The subjective and objective signs which the patient presents should suggest the type of process at work in the affected kidney. These two types of infection should be recognized upon inspection of the diseased organ at the time of operation, for experience has shown that these different types of infection do not require the same form of treatment. While the kidney containing numerous focal abscesses requires nephrectomy, less radical measures suffice in the diffuse, non-suppurative form of inflammatory infection.

From the *clinical aspect* of the subject the picture which *unilateral multiple abscess formation* produces is an acute disease which may or may not be ushered in by a chill. There is a rapid rise of temperature to 102° to 105° F., an early acceleration of pulse-rate usually to 120 or higher, occurring often within twenty-four hours following the onset. The picture of sepsis or toxæmia and a high leucocytosis develops rapidly. Pain on the side of the affected organ, abdominal tenderness, muscular rigidity and spasm are found on the affected side. Lumbar tenderness, rigidity and spasm are pathognomonic signs of the disease. The abdominal signs are similar to those occurring in acute affections of the appendix and gall-bladder, for which the disease of the kidney under consideration is often, if not usually, mistaken. Unfortunately, the urine in this disease does not excite suspicion of

the true condition, as it is usually quite normal in its gross and microscopical appearance and generally contains but little albumin and only a small amount of pus- and blood-cells, because the abscesses find no avenue of escape through the collecting tubules, which are either plugged by the product of inflammation or compressed by infiltrated tissue surrounding them.

When the infection is severe, the patient grows progressively and rapidly worse, the toxæmia becomes profound, delirium sets in, and there is a fatal termination within a few days unless the body is rid of the infected organ.

Of this form of the disease the writer has observed four cases.

CASE I.—Woman, 38 years old, entered the Gynecological Service of the Boston City Hospital under the care of Dr. Franklin Newell and Dr. Ernest Young on March 27, 1912. The past history was negative, with the exception that one year ago both tubes, ovaries, and the appendix were removed for acute inflammation.

The illness for which the patient came to the hospital was characterized by severe pains in the right kidney region, chills, fever, and vomiting beginning three days before entrance and gradually increasing in severity. The temperature at entrance was 103.4° and the pulse 120, leucocytosis 28,000. The general condition of the patient was poor. The physical examination showed a flushed face, throat and lungs negative, aphæmic murmur in the heart. The abdomen was not distended, but showed general tenderness in the right half, much more tender than the left. Exquisite tenderness in the right upper quadrant and in the right loin. There were rigidity of the right rectus and lumbar spasms. Vaginal examination was negative. The urine was turbid, 1020, acid, slight trace of albumin, no sugar or bile. The sediment was small in amount and consisted chiefly of pus, an occasional blood-corpuscle, and epithelial cells. The patient's condition became progressively worse during the following two days, and on the third day after entrance to the hospital (six days after onset of the trouble) it was extremely bad. At this time the writer saw the patient in consultation with Dr. Ernest

Young. Her appearance was that of profound sepsis, pulse 130, of poor quality, temperature 103°. There was rigidity of the right side of the abdomen, with marked tenderness over the right kidney in front and in the back. The urine at this time was only turbid and contained but little pus. The leucocytosis was 18,000.

It was believed that the patient had a nephritic or a perinephritic abscess. An operation was advised as the only chance for life, although the risk was considered great.

A lumbar incision was made, the perinephritic mass found infiltrated with cloudy serum but no pus. The kidney was exposed and delivered. It was twice normal size, congested, and over the surface were scattered many focal abscesses from 1 to 5 millimetres in diameter. The pedicle was clamped and the kidney removed. No attempt was made to tie the pedicle on account of the poor condition of the patient, stimulation and salt solution being required during operation. The clamp was left on the pedicle, the wound drained by a spiral tube with gauze and the wound partially closed.

Twenty-four hours after operation the patient's temperature dropped to 100° and the pulse to 110. The improvement in appearance and general condition was perceptible. The clamp was removed from the kidney pedicle on the sixth day. The patient made an uneventful recovery.

The pathological report was acute inflammation of the kidney, with multiple miliary abscesses from which the staphylococcus pyogenes was recovered.

At present (five months after operation) the patient is in good health and the urine negative. The etiological factor producing the kidney infection could not be traced.

Case II.—Woman, 32 years old, seen in consultation with Dr. Albert F. Griffiths and Dr. Nathaniel Thayer at the Swedish Hospital, Brooklyn, New York, on September 27, 1907.

The history is as follows: Previous health excellent. Two days ago began to have pain in right kidney region, chill, rise of temperature to 103°, and urine became cloudy, contained ¼ per cent. albumin and considerable sediment, consisting of pus, normal and abnormal blood, but no casts. The pain became more severe, and her general condition failed rapidly. When seen by the writer the general condition was poor, temperature 103.5°, pulse 108, urine as above mentioned. There was tender-

ness over the whole right side of the abdomen, rigidity of the right rectus, and muscular spasm over the right kidney in front. There was an exquisite lumbar tenderness with spasm. The kidney was approached through a lumbar incision, the perirenal fat found to be œdematous and adherent to the kidney capsule in the central third of the organ. The kidney was freed and delivered, found to be about one-third larger than normal and much congested. In the middle quarter an area about one and one-half inches in length, of irregular surface, slightly harder than normal, was found. This area extended over the anterior and posterior surfaces of the kidney to within about three-quarters inch of the renal pelvis. The kidney was split in the convex border and the area observed on the surface was found to involve the central quarter of the kidney down to the renal pelvis. This area, darker than the surrounding tissue, contained several small foci of purulent material from one to four millimetres in diameter. The remainder of the kidney showed only congestion. A wedge-shaped piece including the centre third of the kidney and passing about one-half inch outside of the infected area was resected. The upper and lower remaining thirds of the kidney were then brought together by mattress sutures and the capsule was united by interrupted catgut sutures. The wound in the back was united around a tube and gauze drain. The temperature dropped to normal on the second day following operation, and the abnormal elements disappeared from the urine. The patient left the hospital fifteen days after the operation with a small, clean, granulating wound. The improvement in general condition was rapid and the patient has remained well since.

The pathological report showed acute inflammation with multiple abscess formation.

Case III.—Woman, 34 years old, presented the following clinical history: About five months ago had an illness characterized by fever, pain in the right side of abdomen and back. It was considered appendicitis by the attending physician. Remained in bed about two weeks, at which time the symptoms had disappeared. An indefinite pain remained in the right kidney region, more noticeable after physical exertion. Three months ago had a similar acute attack.

On August 1, 1906, the patient was again taken acutely ill, and when seen by the writer had a temperature of 101.8°, pulse

110, and a leucocytosis of 18,000. The urine was negative except for a slight trace of albumin and a few pus- and blood-cells. There was severe pain in the right hypochondrium and an acute tenderness and rigidity over the right rectus and in the right costo-vertebral angle. The appendix region was negative. During the following two days the temperature rose to 104, pulse 120, and white count to 22,000. The urine remained the same. The pain, tenderness, and rigidity became more marked and the patient began to look toxic. The diagnosis of acute inflammation of the kidney was made. The kidney was approached through the lumbar region, the perirenal fat found œdematous and the kidney about one-third larger than normal. Beneath the capsule were many small miliary abscesses. The pedicle was clamped, the kidney removed. The pedicle was tied and the wound closed about a rubber tube with gauze.

Within two days the temperature and pulse had fallen to normal, and the general condition of the patient was much improved. The patient, last seen two years ago, was well. The pathological report was acute inflammation of the kidney with abscess formation, areas of scar tissue.

Case IV.—Woman, 33 years old, presented the following history: Previous health excellent. Four days ago she was suddenly taken with severe pain in the right upper quadrant of the abdomen, accompanied by vomiting. Has felt feverish and has had several chills during the past few days. When seen by the writer, November 15, 1908, the temperature was 102.4°, pulse 108, white count 17,200. In the right hypochondrium there was marked tenderness and rigidity. In the costo-vertebral angle exquisite tenderness and muscular rigidity. Urine slightly high in color, 1014, acid with a trace of albumin. The sediment was small in amount and contained many leucocytes, rare normal and abnormal blood-cells, hyaline and brown granular casts, and occasionally fatty renal cells, a few squamous epithelial cells. The patient remained in this condition without much change for four days, when it became evident that the toxæmia was becoming more pronounced. The kidney was approached through the lumbar region, the perirenal fat found œdematous, the kidney somewhat enlarged, and beneath the capsule could be seen many discrete abscesses about two to four millimetres in diameter. A nephrectomy was performed, the

pedicle tied, the wound drained; the temperature and pulse fell to normal on the third day, the abnormal elements disappeared from the urine except for the presence of epithelial cells. The pathological report was acute inflammation of the kidney with abscess formation. The patient has remained well since operation.

The clinical picture produced by a diffuse inflammatory process within the kidney without abscess formation differs from that with abscess formation chiefly in the severity of the symptoms. The onset may be sudden, as in the former type, the temperature rising rapidly to 102 or more, associated with acceleration of the pulse-rate; and a leucocytosis is always present, often high. A chill may accompany the onset. Pain in the loin on the affected side is an early symptom, sometimes indefinite but often severe, varying according to the severity of the process. Tenderness over the kidney in the costo-vertebral angle, with some muscular rigidity and abdominal tenderness and rigidity on the affected side, is a constant sign. The chief feature differentiating this form of the disease from that of abscess formation is the lack of progressive toxæmia and the presence of more abnormal elements in the urine. These patients, while appearing acutely ill, do not have the real progressive toxic course which characterizes the other form of the disease. The illness, after the first few days following the onset, remains more or less stationary and may continue not unlike a beginning typhoid fever. The pain, tenderness, and muscle rigidity may become gradually more pronounced, and the temperature, pulse, and leucocytosis elevated; or the different signs may gradually decline. Remissions in the acute symptoms occur, but indefinite pain on the affected side usually persists indefinitely, and recurrences of the acute symptoms are not uncommon.

The writer has observed four cases in this type.

Case V.—Woman, 43 years old, seen in consultation with Dr. H. W. Baker and Dr. A. W. Tucker, of Lynn. Thirteen years ago the patient had a severe illness, characterized by pain in the right side of the abdomen and back, fever, chills, and

cloudy urine. In bed several weeks. Since that time has had several similar attacks which confined her to bed for from two weeks to three months, and different physicians who cared for her have considered that in these attacks she was suffering from peritonitis. Some advised operation, which the patient refused. Between these attacks there has been a constant pain, varying in severity, in the left kidney region. Several X-ray examinations have shown nothing abnormal. Four years ago the patient had a small amount of blood in the urine during one of these attacks. This occurred again two years ago. It never lasted more than a few days.

On February 2, 1912, the patient was cystoscoped by Dr. H. W. Baker and a collargol injection and radiogram were made of the left kidney. The cystoscopy showed the bladder to be normal in all respects, both ureteral orifices were normal, and the catheters were passed to each kidney. The specimen of urine collected showed that from the right side to be normal, and that from the left to contain a few leucocytes, normal red cells, and caudate epithelial cells. The capacity of the renal pelvis was 14 c.c. The radiogram of the injected kidney pelvis showed it to be normal.

On February 14, 1912, the writer again cystoscoped the patient, and found the condition as previously stated. An injection of six milligrammes of phenolsulphonephthalein showed the dye to appear on the right side in six minutes, on the left in nine minutes. The total amount recovered in two hours was: right 25 per cent., left 10 per cent. On account of the persistent pain an exploratory examination of the kidney was undertaken. Temperature at the time of operation was 102.2°, pulse 100, leucocytosis 8100. The operation was performed February 16, 1912. An anterior incision was made. The peritoneal cavity was opened and explored. Nothing abnormal was found. The peritoneum was closed and stripped toward the median line, exposing the left kidney retroperitoneally. The perirenal fat was found adherent to the kidney capsule. The kidney was but little larger than normal, and several grayish depressed areas were seen beneath the capsule. On section showed many pale-grayish, sclerotic areas, some near the cortex, others in the pyramid. The remainder of the kidney was reddish-yellow, and there were acute red streaks near the apices of the pyramids.

In view of the history these areas were considered to be old resolved foci of acute inflammation. It was believed that the persistent pain following the acute attack was probably to be explained by these contracted areas, and the kidney was therefore removed. The fat about the pedicle was adherent to the vessel, and as they could not be entirely cleaned the pedicle was clamped and the wound closed about the clamp, which was removed on the fourth day. The patient made an uneventful recovery except for an infection which took place in the wound.

Pathological report is as follows: The surface presents several opaque, grayish areas which are depressed and contracted. Some of these areas are surrounded by a small area of injection irregular in outline. On section several similar but smaller opaque areas not surrounded by areas of injection are seen scattered throughout the kidney substance. Near the upper pole is seen an area two cm. in diameter, symmetrical and definite in outline, containing another area which is apparently a blood-clot. The capsule of the kidney strips easily, leaving a red surface in places. Cortex measures six mm., and glomeruli are indistinct. Histological diagnosis is acute, diffuse inflammation of the kidney with healed areas.

Three months after operation the patient was in the best health which she had enjoyed for many years. She was free from pain, and the urine was normal. She had gained 34 pounds in weight. Eight months after operation excellent health continues.

Case VI.—Man, 31 years old, seen in consultation with Dr. Richard Collins at the Waltham Hospital, January 25, 1910. Since childhood the patient has had a chronic discharge from the right ear. About ten years ago had a severe attack of pain in the right kidney region, the facts regarding which are indefinite. Five years ago had a similar attack and passed a small amount of blood in the urine. Confined to the bed for a short time. Four years ago had a similar attack, associated with frequent urination. Since this attack has had pain in the right kidney region almost constantly. About two years ago he had another attack, associated with fever and frequent urination, and passed small amounts of blood in the urine several times.

Five days ago, after a hearty dinner, patient had a severe attack of pain in the right side, associated with chill and vomit-

ing. Then admitted to the Waltham Hospital, acutely ill, with pain in the right side, temperature 102°, pulse 104. Acute symptoms gradually subsided, but pain in the back persisted. X-ray examination was negative. Seen by the writer February 25, 1910. The patient's condition as above noted. A cystoscopy performed at this time showed the bladder urine to be slightly cloudy and containing fine shreds. This urine was 1020 in specific gravity, acid, and the sediment showed considerable pus, small round and many squamous epithelial cells. There was considerable fresh blood. Trigone was normal. Both ureteral orifices normal in size and character. About three-quarters inch above the right ureteral orifice was seen a group of eight or ten acutely injected areas from which bleeding had taken place and on which were adherent blood-clots. These areas were a little larger than the head of a pin and resembled early tuberculosis of the bladder. The remainder of the bladder was normal. Both ureters were catheterized and the urine collected from both was equal in amount. The examination of the urine from the left side little abnormal, from the right side considerable pus and normal blood-vessels; a few caudate and small round cells. Guinea pigs inoculated for tuberculosis did not develop the disease.

On January 29, 1910, an exploratory examination of the kidney was undertaken on account of the persistent pain and cystoscopy findings. The kidney was exposed through the loin. Perirenal fat was but slightly adherent to the kidney. Kidney delivered and found slightly larger than normal. Beneath the capsule were seen a few grayish-white, contracted areas and a few acutely red areas. Nothing abnormal in the remainder of the kidney or kidney pelvis. The kidney was split in Brödel's line. In the region of the contraction seen on the surface there were hard, grayish areas about one and one-half centimetres in diameter; similar pale, contracted areas were scattered through the kidney tissue. There were two acutely reddened areas in the upper half of the kidney. Believing the persistent pain to be due to these contracted areas, the kidney was removed, the pedicle was tied and the wound drained.

The temperature, which was 101.5° at the time of operation, dropped to normal within 24 hours. The wound healed by first intention.

The pathological report was an acute, diffuse inflammation

of the kidney, with healed areas. The colon bacillus and *Staphylococcus pyogenes aureus* were recovered from the tissues. The last organism may have been a contamination.

The last heard of the patient was about one year following operation, when he reported as well.

CASE VII.—Long Island Hospital. Woman, 24 years old, giving a previous history of syphilis four years ago. Treated with mercury continuously for three years.

On January 7, 1910, laparotomy was performed by another surgeon because of severe pain on the right side of the abdomen, associated with spasm and tenderness over the right rectus muscle. This time the temperature was 102.5°. A few small cysts of the ovary were found and a normal appendix was removed and a thorough exploration of the remaining abdominal organs proved negative. Following operation the pain in the right side persisted, the temperature ranged between 101° and 104° and the pulse around 120. The white count was around 14,000. This condition persisted for about one week, when the temperature returned to normal, the pulse to 100, and the pain and tenderness became much less.

One week later the pain again became severe, the temperature rose to 102°, and the right side of the abdomen and back became very tender. Examination showed marked tenderness and involuntary spasm over the right abdomen and back. White count was 23,000. The patient remained in this condition for about one week, when symptoms again gradually subsided. The urine at this time showed but a trace of albumin, a small amount of pus, single and in clumps. A few small round cells and granular casts.

Two weeks later another acute attack of pain on the right side. Temperature rose to 102°, pulse to 120. The 24-hour amount of urine at this time was 550 c.c. The sediment at this time showed more pus, many small, round epithelial cells and a few hyaline and granular casts. A Röntgen-ray examination was negative.

The writer first saw the patient in this attack. At this time there was general abdominal tenderness and spasm, more marked over the right side. There was exquisite tenderness and spasm in the right costo-vertebral space. The general condition was only fair and suggested toxæmia. The diagnosis of acute inflammation of the kidney was made and operation undertaken.

An anterior incision was made, the peritoneum opened, the abdomen explored and found to be negative. The anterior incision was closed. The kidney was then approached through the loin. The perirenal fat was found adherent to the kidney and a hard nodule about the size of a Concord grape situated in the perirenal fat was removed. The kidney was slightly larger than normal and showed many red areas beneath the capsule. On section of the organ similar areas were found scattered through the kidney substance. Nephrectomy was performed, the pedicle tied and the wound drained.

Four days following the nephrectomy the patient developed a right lobar pneumonia, which a few days later involved the left side, and death occurred 11 days after operation. The wound at this time had healed except for a small granulating area.

The pathological report showed acute inflammation of the kidney, with several areas showing connective-tissue repair. The *Bacillus coli* was recovered from the tissues.

Case VIII.—Woman, 48 years old, seen in consultation with Dr. H. W. Baker, March 2, 1912. The patient presents a history of having had repeated attacks of pain in the left kidney region, associated with fever, chills, and vomiting. These attacks confined her to bed for periods of weeks many times during the past five years. Since the first attack there has been constant pain in the left kidney region, and during the past year the patient has been unable to lie down in bed and has been obliged to sleep sitting up on pillows. On March 1, 1912, the patient was cystoscoped by Dr. H. W. Baker. The bladder was found to be normal. Both kidneys were catheterized. The urine obtained from the right side was acutely red with fresh blood, with a few squamous and large round cells. The fresh blood was believed to have been caused by the catheter. The urine of the left side was slightly cloudy and showed a few pus-cells, single and in clumps, many squamous, polygonal and large round cells, many clumped with fat drops adherent.

The patient was seen by the writer on March 4, 1912. She was a poorly-nourished woman, weighing 110 pounds, and complained of severe pain in the left kidney region. There was tenderness in the costo-vertebral angle. The temperature was 99.4° and the pulse 108. As a result of the consultation it was decided that an exploratory operation of the kidney should be made.

Operation (March 10, 1912).—The kidney was approached

of the kidney, with healed areas. The colon bacillus and *Staphylococcus pyogenes aureus* were recovered from the tissues. The last organism may have been a contamination.

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Operation (March 10, 1912).—The kidney was approached

through an anterior incision, the peritoneal cavity opened and explored. Nothing abnormal was found. The peritoneal wound was closed and stripped toward the median line, exposing the kidney. The perirenal fat was slightly adherent to the kidney. This was freed and the kidney delivered. The organ was of normal size and rather pale. The organ was split in Brödel's line. The cut surface showed the tissue everywhere to be paler and firmer than normal, and as there were no focal changes in the kidney tissue and the structure of the kidney was normal, other than for its pale character, it was decided not to remove the organ. The capsule was stripped, the kidney fixed in position, and the wound entirely closed.

The patient made an uneventful recovery. The wound healed by first intention, and two months following operation there is but slight pain of the old character, which comes only after unusual exertion. The urine still contains polygonal and large round cells with a small amount of fat. Six months after operation the old pain had entirely disappeared and the urine contained but a few squamous epithelial cells.

It is believed that the pathological process present in this kidney was a connective-tissue repair of a diffuse inflammation involving the whole kidney. The kidney was left in this patient as more or less of an experiment.

During the past few years the writer has seen five patients in whom all signs pointed to a diffuse acute inflammatory unilateral process of the kidney in whom the symptoms subsided without operation. In two of these cases the colon bacillus was isolated from the affected kidney by means of the ureter catheter. The only sign of the disease remaining in these cases has been an indefinite pain in the region of the affected organ. In but one of these patients is this constant, and in the other four it may be considered absent, except during periods of fatigue. The urine in all shows but little abnormal.

In conclusion, I would like to say a few words in regard to the treatment in these two classes of cases.

In the first class, the single kidney with multiple miliary abscess formation from which malignant toxæmia results, the organ must be sacrificed in order to save the patient's life.

In the second case of this class, mentioned in this report, only the central quarter of the kidney was involved. While this infected area was completely removed by a resection of a middle third of the kidney and the healthy upper and lower third united successfully, and the outcome of the case was most favorable, this procedure must be considered most hazardous and cannot be recommended. Woolsey (ANNALS OF SURGERY, October, 1906) reports a similar instance in which he successfully removed the lower third of the kidney for the same disease. In the other three cases of this class, here recorded, nephrectomy was performed, and it is felt that in each instance it was the only means which could have been employed to save the patient's life. All these patients are living to-day and are free from symptoms, considering themselves well.

While house surgeon at the Boston City Hospital, the writer observed two cases of this form of the disease: one upon whom Dr. Paul Thorndike did a nephrectomy followed by recovery, and one in which Dr. F. S. Watson did a nephrotomy with drainage followed by death from progressive toxæmia.

The proper treatment in the second class, the type of diffuse, acute, unilateral inflammation of the kidney, is not so clear cut and must depend upon the course of the disease in the individual case. As a broad rule, it is felt that palliation, forcing fluids and the employment of urinary antiseptics, fortifying the patient's strength by a nutritious diet and stimulating drugs, should be instituted at the outset, and operative interference should only be undertaken when the symptoms and physical signs give evidence of progression to the point of lowering the general resistance by toxic absorption. The time to operate upon this class of cases requires experience with the disease and judgment in regard to the patient's general condition. Some of these patients recover without operation, as noted by Brewer, Cobb, and the five cases mentioned in this report.

When an operation is undertaken in this class, nephrec-

tomy is not the only procedure to be employed. Favorable results have been obtained by simple decapsulation (Cotton, ANNALS OF SURGERY, November, 1911), by puncture of the infected areas with drainage (Brewer, *Trans. Am. Surgical Association,* vol. xxvi, 1908, and Cobb, ANNALS OF SURGERY, vol. xlviii, 1908), and by splitting the kidney, closing the kidney wound by suture, and decapsulating the organ, as in the fourth case of this class recorded in this report.

On the other hand, when the symptoms and signs are of a distressing nature and the affected kidney is found to be the seat of old as well as new inflammatory processes, or when the acute process is extensive, as in Cases 5, 6 and 7 of this report, nephrectomy is the best procedure.

In closing I desire to express my sincere thanks to Dr. F. B. Mallory, Director of the Pathological Department of the Boston City Hospital, for his help in preparing the pathology of this subject and for most of the pathological reports.

THE MANAGEMENT OF THE GRAVE EMERGENCY CASES OF EXTRA-UTERINE PREGNANCY.

WITH A STUDY OF 137 CASES OF TUBAL AND INTERSTITIAL PREGNANCY AT THE MASSACHUSETTS GENERAL HOSPITAL FROM 1902 TO 1910.

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THIS paper is based on a careful study of 137 cases of tubal and interstitial pregnancy at the Massachusetts General Hospital during the nine years from 1902 to 1910, including my own cases. The object in undertaking this study was to obtain information in regard to the wisdom of immediate operation in the desperate cases of rupture with severe hemorrhage. Inasmuch as quite recently certain prominent gynæcologists in this country have seen fit to advise the dangerous method of delay in these cases I feel it of the utmost importance to contradict this teaching, believing that far-reaching and lasting harm may have been done. For this reason, therefore, this study was made and this article written. While the major part of the paper will be devoted to the question of the best management of these emergency cases, certain conclusions based on a study of all the cases will be made and some attention paid to the interstitial cases.

My interest in this subject was aroused by the symposium at the meeting of the American Gynæcological Society held in Philadelphia in May, 1908, the subject of which was "Immediate versus Deferred Operation for Intra-abdominal Hemorrhage Due to Tubal Pregnancy." At this meeting certain men of prominence advised delay in the extreme cases, waiting to see if the hemorrhage would continue, advancing the idea that such patients seldom die from loss of blood, but mainly from shock; that in all the cases bleeding will stop of itself; that in most of the cases when operation is done no bleeding vessel is

found. The most radical advocate of this dangerous method was Hunter Robb of Cleveland. He doubted whether death as a result of tubal rupture is due to hemorrhage, and thought that in most of the cases the bleeding will cease before death; that when the surgeon finds fresh spurting blood at operation it is due to blood that has been under tension in the sac; that if the surgeon waits, all the emergency cases will show signs of improvement and should be stimulated by salt solution, etc. His experience consisted of only 20 cases, five of which were considered so critical that they were not operated upon until an average of 18 hours after coming into the hospital, and all but one showed marked improvement before operation under rest and stimulation.

These opinions were opposed vigorously by other members entering into the discussion. There seemed to be such a difference of opinion that I was led to see if an analysis of a large number of our own comparatively recent cases would support me in my strongly formed opinion that all of these cases should be operated on without delay.

It may be said, perhaps, that nothing new remains to be written in regard to extra-uterine pregnancy. A study of this series of cases, however, has emphasized some important facts of value in relation to diagnosis and treatment, certain of which are at variance with the usually accepted teachings.

The cases have been divided into two broad classes: (1) The grave emergencies, with sudden symptoms followed by alarming hemorrhage, which cases need operative treatment at once; it is this class of case to which the writer has paid special attention, the number of which is 36. (2) The non-emergencies, with less alarming symptoms and signs of varying degree and kind. This second class can be further subdivided into: (*a*) partial ruptures with recurring progressive and slight hemorrhages; (*b*) tubal abortions; (*c*) cases of unruptured tubal pregnancy.

It is recognized that there are "border-line" cases and, therefore, pains have been taken to include in the group of emergency cases only the extreme clinical types of hemorrhage and shock, the truly desperate cases.

Under the head of grave emergency cases are placed the cases of ruptured interstitial pregnancy, three in number, of which two were operated on by myself.

It is remarkable that this series includes so many cases of interstitial pregnancy. The condition is exceedingly rare. Newell, in his list of 60 cases from the Boston City Hospital, found no case of interstitial pregnancy. Martin found one case in 77 ectopic cases.

A study of all the cases justifies the following conclusions:

1. More than 33 per cent. of extra-uterine pregnancies occur in young women who have never before been pregnant.

2. Salpingitis, or pelvic infection, is not an essential or frequent causative factor.

3. Most of the cases of complete rupture with alarming hemorrhage occur in the early weeks, often in the first month; these are the cases that are rapidly fatal unless operated on. Cases that have gone two months or more are those that furnish the greatest number of non-emergency cases.

4. Cases of sudden, severe rupture, until signs of marked intra-abdominal hemorrhage are present, often simulate other grave abdominal emergencies with abdominal tenderness and spasm, high white blood count, fever and vomiting.

5. In grave emergencies with signs of extreme hemorrhage, operation should be done at once without waiting for a possible reaction.

6. In the less severe cases of tubal rupture, without signs of marked hemorrhage, a correct diagnosis is often difficult or impossible.

7. The menstrual history cannot be depended upon; many of the most alarming cases had skipped no period.

8. The character and location of the pain may vary within wide limits.

9. Tubal abortions are nearly as frequent as tubal ruptures. Cases of tubal abortion seldom give a history of skipping a menstrual period, but a history of continued slight flowing or dribbling since the last period.

This series furnishes a surprisingly large number of cases that had not been pregnant previously. Extra-uterine preg-

nancy generally had been supposed to be a condition in the middle third of child-bearing years and to occur in women who had been pregnant comparatively recently. Newell, in his article above referred to, found only nine out of sixty cases who had never had children before. It is, therefore, important to remember that extra-uterine pregnancy *does occur frequently in young women who have never been pregnant* and to remember that these are the cases in which hemorrhage is apt *to occur early and most likely to be fatal.* In other words, that these cases furnish the majority of the grave emergencies.

The non-emergency cases are so named because they were either cases of rupture or tubal abortion with slight hemorrhage, or, what was more common, with several slight hemorrhages covering a longer or shorter period of time; cases characterized by abdominal pain varying in its location and intensity with or without bleeding by the vagina and without any positive signs of intra-abdominal hemorrhage, which made the diagnosis of ruptured tubal pregnancy in the emergency cases easy. It is this kind of case of ruptured tubal pregnancy which is so seldom correctly diagnosed before operation. It is exceedingly difficult, if not impossible, to differentiate a case of progressive rupture with pain and irregular flowing from a case of endometritis or salpingitis. All of the non-emergency cases had skipped one or two menstrual periods before rupture, or gave a history of irregular or steady flowing for over eight weeks.

Statistics to be of any value in determining the wisdom of immediate operation versus delay, should be taken from recent years, from the practice of skilled surgeons, and be based only on those cases operated on since the routine use of intravenous salt solution. In arguing for immediate operation one must take pains to consider only the really desperate cases, and in considering the mortality and estimating the percentages, only the deaths due to the operation itself should be taken into consideration; late deaths from peritonitis, pneumonia, etc., must be thrown out.

With this in mind the following statements are made:

1. That immediate operation is the method of choice.

2. That delay even for transfusion is dangerous and fatal, and especially *delay with stimulation.*

3. That with proper technic and use of intravenous salt solution the percentage of deaths directly due to operation will be very low.

4. That in a very small percentage of cases direct transfusion will be needed and will save the small number of cases that would be fatal otherwise.

5. That direct transfusion should be done after operation, not before.

6. That at present, with the availability of infusion and direct transfusion, it is criminal for any operator of reasonable skill to delay.

The above conclusions are based on my own experience and on the following critical analysis of 36 genuine emergency cases.

ANALYSIS OF EMERGENCY CASES.

Of the 137 cases studied, 36 were cases of desperate emergency because of the advanced intra-abdominal hemorrhage. Three of these were cases of ruptured interstitial pregnancy; these will be considered in detail later. They were brought to the hospital in an exceedingly unfavorable condition. All of them were operated upon practically as soon as seen by the surgeon. Eight cases were operated on by myself.

Right or Left Tube.—The left tube was the site of the pregnancy in 18 cases, the right tube in 15. The *site of rupture* was in the inner third of the tube near the uterus in 6 cases, in the middle third in 5, near the fimbriated end in 6. In 16 it was not given.

Time of Rupture.—There were 17 cases of very early rupture, from three to six weeks; there were 7 cases under four weeks, 6 between the middle and end of the second month.

Temperature.—In only two cases was the temperature normal or below. In 15 it was over 100° F. The highest temperature was 102.5° F.

Leucocytosis.—In 12 cases no record of a leucocyte count

is given, but in the majority of the cases in which it was taken it was very high, from 20,000 to 45,000. In two cases it was not markedly increased, one case 9500 and the other 15,000, showing that in exceptional instances the outpouring of red blood-corpuscles into the abdominal cavity does not give a high leucocyte count.

Menstrual History.—In 9 cases no menstrual period had been skipped and there had been no irregular flowing, nothing pointing to pregnancy or abnormality of any kind. In three other cases one period had been skipped and there had been more or less irregular flowing since the last period, which had continued from four to six weeks.

Onset.—In 16 cases the onset was sudden and was preceded by no warning symptoms, as pain or vaginal hemorrhage. In other words, the patient was all at once seized with pain, abdominal tenderness and vomiting with collapse, followed with greater or less rapidity by signs of abdominal hemorrhage. In 17 cases, however, some warning signs preceded the emergency condition from one to ten days. In 7 cases there was general abdominal pain from eight to 36 hours before the onset. In two cases the pain was in the right iliac region for twenty-four hours before and in one case in the left for the same length of time. One case had warning pain about the umbilicus for ten days before rupture.

Hæmoglobin.—Hæmoglobin was reported on in only 6 cases, the lowest 35 per cent. and the highest 70 per cent.

Vaginal Examination.—In only 13 cases could a mass be felt by bimanual examination. Bleeding from the vagina at the onset of pain occurred in only 7 cases.

Symptoms Resembling Abdominal Infection.—In 22 cases there were marked symptoms and signs at the onset of some grave abdominal infection—pain, muscle spasm and tenderness, vomiting and fever. In only four cases were these distinctly absent. The practical importance of this will be considered later.

Technic of Operation.—Irrigation of the peritoneal cavity with salt solution was done in 14 cases. In 19 cases the blood

was wiped out with dry sponges. Abdominal drainage with gauze or cigarette drains was used in 8 cases; in one case gauze drainage by vagina. In 24 cases there was no drainage. Intravenous salt solution was used during or just after operation in 21 cases.

Active Bleeding at Time of Operation.—In 10 cases it was noted specially that there was active arterial hemorrhage going on from the ruptured tube, and one case died from continued hemorrhage after operation because no ligatures were used.

Mortality.—Twenty-eight cases recovered, five died, but of the five deaths one was on the eighteenth day from pneumonia and one died from continued hemorrhage because, for some reason, the operator did not apply any ligature to the tube or vessels. One case died of septic peritonitis a week after. This leaves only two cases that did not rally from the operation and died within a few hours—one tubal and one interstitial. The cause of death in the three other cases would have been the same whether immediate or delayed operation had been undertaken, an immediate mortality, therefore, of only 5.5 per cent., but direct transfusion was not attempted in either of the fatal cases. It is fair to assume that by its use the mortality could have been reduced at least one-half. Coues presented a review of 214 cases of extra-uterine pregnancy from the same hospital. His paper, while interesting, is of little statistical value in relation to our special subject because he based his paper on the cases from 1888 to the present time, going back over many years before the technic of the operation had been perfected.

As I have said before, only those cases operated on in the last few years should form a basis for our conclusions. In my total of 137 cases there was no case which I have called a desperate emergency in which delay was attempted or practised. Coues, from his larger total from a much longer period of years, found 24 cases in which operation was delayed with a mortality of 2, or 8 per cent., and mentions one case that died without operation.

Further analysis of these 36 emergency cases in relation to symptoms is of great clinical interest.

It is frequently taught in text-books, and probably many general practitioners believe that to make a diagnosis of ruptured tubal pregnancy it is necessary to have a history of irregular menstruation with the skipping of at least one period, sudden pelvic pain and signs of hemorrhage accompanied by subnormal temperature. The menstrual history cannot be depended upon and the character and location of the pain may be variable and misleading. As has been stated, in 9 cases no menstrual period had been skipped and there was nothing pointing to pregnancy or abnormality of any kind. The only constant diagnostic sign was that of extreme intra-abdominal hemorrhage. In the great majority of the cases the symptoms and signs at the onset exactly simulated some acute abdominal condition, either infection or perforation. In most of the cases patients were seized with sudden pain and abdominal tenderness and vomiting followed by collapse and signs of hemorrhage. The pain was not pelvic pain, but was referred to various parts of the abdomen, in one case to the umbilical region, in two cases to the epigastrium running through into the back, in another case to the gall-bladder region and in four other cases of sudden rupture the pain was high enough up to suggest gastric or duodenal ulcer with perforation or acute cholecystitis. In most of the cases nausea and vomiting were associated with the pain. Accompanying the abdominal pain it should be noted that abdominal tenderness was present, together with muscle spasm of the abdominal muscles remote from the pelvic region. The presence of abdominal tenderness is rarely mentioned in text-books. In none of the cases was the pain located in the pelvis and in none was it said to run down into the thighs. Therefore, were it not for the signs of extreme hemorrrhage, the symptoms would have pointed to some other form of grave abdominal emergency, intestinal perforation, infected gall-bladder, or acute appendicitis. It can be concisely stated that in sudden abdominal pain in women with or without a history of menstrual irregularity, and no matter where the

location of the pain or the accompanying abdominal tenderness, even if nausea and vomiting are present, the diagnosis in every case will be ruptured tubal pregnancy if the signs of rapidly increasing intra-abdominal hemorrhage are present, but, on the other hand, without signs of marked hemorrhage the symptoms may be those of several other grave abdominal conditions. The evidence of serious hemorrhage—pallor, restlessness, rapid and compressible pulse and dulness in the flank—will be too pronounced to be overlooked.

It should be remembered that the vast majority of the most serious cases of ruptured tubal pregnancy, those which are most likely to go to a rapid, fatal termination from hemorrhage, occur in young women never previously pregnant; that there may be nothing to suggest pregnancy; that the onset may be extremely sudden, and that at the onset the case may exactly simulate some other acute abdominal condition; that it is the duty of every practitioner to remember this.

In the non-emergency cases, where the bleeding has been less, even though a considerable quantity of blood is in the pelvic cavity, the diagnosis of hemorrhage will be difficult. Oftentimes the operator is surprised at the amount of blood found on opening the abdomen in the cases in which the diagnosis between ruptured tubal pregnancy and pelvic infection was uncertain. It should be stated that in this class of cases the history in regard to the character and location of the pain is seldom misleading. Pain is usually pelvic, intermittent in character and frequently described as running down into the thighs. The operation, if properly and rapidly done, will not add to the existing shock and collapse. With proper technic the hemorrhage can be stopped and the operation completed with extreme swiftness. A case should go from the operating table in better condition than when the anæsthesia was begun. It is admitted, however, that an operation poorly planned and prepared for and slowly done will be fatal in many such cases. The operation should not be begun until everything is in readiness, but it is obvious that the preparations should be made as speedily as possible. Shock and collapse until the hemorrhage

is stopped should be combated only by morphine subcutaneously and artificial heat.

When the instruments and materials for the operation, including the equipment necessary for intravenous salt infusion, are all ready, and when the assistants and nurses are gowned and ready, the abdomen in the meantime having been prepared with green soap and alcohol, then and only then should the anæsthesia be started. The anæsthetic should be straight ether. This should be given on the operating table with the operator and assistants ready for immediate work. Previous to the general anæsthesia, while the preparations are being made, the median basilic vein in one of the arms should be exposed under cocaine by an assistant ready for opening and the giving of the intravenous salt solution immediately after the hemorrhage is checked. At the first signs of relaxation the patient should be placed in the Trendelenburg position and the abdomen opened in the median line. Without attempting to evacuate the blood and clots, first one ovarian artery and then the other should be caught with long clamps. As soon as this is done intravenous salt infusion should be started, strychnia given, and the most of the blood and clots washed from the peritoneal cavity with a generous use of hot salt solution. The tube in which the pregnancy is located should be doubly ligated and removed and the abdominal wall closed by through and through sutures of silkworm gut without drainage. With this technic and attention to detail before beginning, the operation can be finished with great quickness. The patient should be in bed in fifteen minutes from the time that anæsthesia is started. The average time of my own operations of this sort has been twelve minutes.

The after-treatment should consist of the usual treatment for hemorrhage—elevation of the foot of the bed, intravenous salt solution, with or without adrenalin, shock enemata, application of artificial heat, bandaging of the lower extremities, etc. In the majority of cases upon which I have operated, the almost instantaneous reaction under proper after-treatment has been to me almost marvellous. The very small

number of cases that will not respond to the above treatment can be saved by direct transfusion, therefore, in every case steps to obtain a donor should be taken at once.

Interstitial or tubo-uterine pregnancy is that form of ectopic gestation in which the pregnancy develops in that portion of the Fallopian tube which is within the uterine wall. It differs from the other varieties of tubal pregnancy in that, because of its location, it usually does not terminate by rupture at so early a period, frequently not until the third or fourth month. The usual termination of this form of ectopic gestation is by rupture into the peritoneal cavity with severe and rapidly fatal hemorrhage; it may rarely, however, rupture into the uterine cavity.

The following brief report of one of my own cases of ruptured interstitial pregnancy is of interest not only as illustrating this type of case, but also as showing in its two stages what I consider emergency and what non-emergency cases.

B. W., forty years old, married, entered the Massachusetts General Hospital through the accident room in the early evening of January 19, 1902. She had had two children, the youngest ten years before. She had been in good health with nothing abnormal since the birth of the last child. She had skipped her last two menstrual periods and considered herself in the third month of pregnancy. About noon on the day of entrance she was taken with sudden, severe abdominal pain and vomiting; there was no fainting or collapse, but the pain persisted.

On first examination the case seemed to be not an emergency. The woman was well developed and nourished, she was somewhat pale, with a pulse of 90 of good volume. There was nothing abnormal in the chest or the urine. The abdomen was full and soft, there was some tenderness in the right iliac region but almost no muscular spasm. There was slight dulness in both flanks. Vaginal examination showed a uterus somewhat enlarged with a soft cervix. There were no masses to be felt in the broad ligaments. The case was sent to the ward for observation, the diagnosis at this time being in doubt. White blood count shortly after entrance was 28,000. Shortly after midnight, following a severe paroxysm of pain and a drop of temperature to subnormal, the pulse became rapidly that of a patient in collapse. She was seen by me within an hour afterward, at which time she

presented a picture of advanced internal hemorrhage, profound anæmia, restlessness, and rapid, compressible pulse.

She was operated upon as rapidly as possible under the diagnosis of ruptured tubal pregnancy, following the technic outlined above. The abdominal cavity was full of clots and fresh blood. In the fundus of the uterus close to the origin of the Fallopian tube was a soft, boggy enlargement the size of two English walnuts in the centre of which was an irregular hole the size of a finger-nail from which fresh bleeding was still going on. Both ovarian arteries were tied and the hole in the uterus closed by mattress stitches of chromicized catgut. Three strips of gauze were packed down to the hole in the uterus. Intravenous salt solution was given during the operation and the patient reacted to a great extent within a few hours. On the following day persistent hemorrhage from the uterus began with large clots. On the sixth day after the operation the uterus was curetted with a blunt curette and considerable tissue removed, which was pronounced true decidua by the pathologist. After this the uterine hemorrhage ceased.

The patient left the hospital well at the end of five weeks. This case was followed up to 1905 and was in good health when last seen.

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OPERATIVE TREATMENT OF FRACTURES.*

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In June, 1909, before this Association at Philadelphia I read a paper on the "Operative Treatment of Fractures," hoping that an increasing number of members would become more interested in developing the operative treatment for selected cases of fractures; two members discussed it. Two weeks later at Atlantic City, before the American Medical Association, Mr. Lane presented a paper upon the same subject. There were few who discussed it. The general sentiment prevailed that the average results after fractures were satisfactory and that operations were unnecessary. In 1911, at Denver, President Harte in his address called special attention to this subject. He stated his belief that careful observation of the end results after fracture justified the conclusion that these results were not as satisfactory as was generally believed, and moreover that our profession was not fully utilizing all the advantages in our power to secure the best results in fractures; therefore, he advised the operative treatment for selected cases, especially in the femur.

In 1909, there were only a few papers on this subject, while in 1912, the literature was full of references to operations. Numerous operations have now been performed by many of our own members and as their experience has increased they have gradually operated earlier and more often because they have obtained better results. Many surgeons are feeling at present that numbers of the "bad set" fractures which become useful only after twelve to eighteen months might be just as good after four to six months if more efficiently treated. These facts show clearly the great increase in the amount of attention

* Read before the American Surgical Association, May 30, 1912.

paid to securing better results after fractures. During the last two years, as our profession has been more carefully investigating the end results after fracture, the surgeons have become *convinced* that the *results must be improved.* The public, since the advent of X-rays, have become better educated and are demanding shorter and more efficient treatment, a briefer period of disability with better functional results.

Feeling that the reporting of illustrative cases will do more to encourage other members to undertake the operative method in *selected* cases, I desire to present the following: As the fractures of the femur are the ones which most frequently demand and finally come to operation, and also as they present the greatest difficulties at operation, the favorable results which can be obtained in these cases should carry corresponding weight in determining which is the best method of treatment in definite selected cases.

In this series of 21 cases of fracture of the femur, operation was performed only after the best efforts of conservative treatment had failed. In every case before operation general anæsthesia had been employed to assist the efforts in reduction, also suitable extension had been applied. Nevertheless, in every case there persisted over 2.5 cm. shortening. Axial rotation was present in all cases, together with angulation.

In operating, I try to scrupulously carry out every minute detail of Lane's technic, for there is no province of surgery in which results depend more upon the mechanical skill and cleanliness of the operator. The day before the operation the part is thoroughly washed and a dry sterile dressing applied. On the day of operation the patient is etherized and then placed upon a platform raised above the operating table, so arranged that the Lemon extension apparatus can be used. The sterile dressing is removed and the entire part painted with 7 per cent. tincture of iodine. The usual operation sheets are placed to carefully exclude all surfaces except the immediate operative field, which is again painted with iodine. The incision, which is always long, from 8 to 10 inches, is made on

the outer aspect of the thigh, being carried through the vastus externus and crureus. To both edges of the skin incision strips of gauze are at once clamped. As the incision is carried through the muscles to the bones, all free bleeding points are firmly clamped but not tied, the clamps acting by their weight as retractors. The clamps are left on the vessels for some time while the other dissecting is continued. Bleeding generally ceases, but if it continues, ligation is done with the finest catgut. The tourniquet is never used, as it is necessary to see at once when any sizable vessel is cut. The tissues are treated gently so as to avoid all tearing, lacerating, and consequent bleeding. Great care is taken to clearly expose the fragments; granulation tissue is cut away with scissors; callus is removed with the rongeur. The ends and edges of the fragments are curetted clearly so as to permit them to fit into each other as closely as possible. The periosteum is protected as much as possible and is not stripped from the bones. In manipulating the ends of the bones to bring them into position I prefer the Lambotte clamps to those of Lane, because they are easier to handle and are self-retaining. After the bones are in position, the Lohman clamp is often most satisfactory in holding the plate securely to the fragments.

Thus far, I have used the regular Lane plate. I have never seen one broken, although cases have been reported. In the future I hope to use the vanadium plates introduced by Dr. William O'Neill Sherman, of the Carnegie Steel Company, if they can be made stronger, lighter, and smaller. In some earlier cases, I tried both wire and kangaroo tendon, but found them absolutely unsatisfactory in fractures of the femur. Lane uses the old-fashioned drill, because its simplicity permits it to be thoroughly and easily sterilized. The handles of the usual twist drills cannot be so easily cleaned, so I have used the Stille drill. Every part is detached after an operation and thoroughly cleaned and sterilized. It is simple, compact, powerful, and easily sterilized. The drill most used is No. 31 calibre standard twist. This makes a hole slightly smaller

than the size of the barrel of the screw. The screws are the ordinary wood screws modified so that the thread is cut up to the head. I prefer them to the finer threaded machine screw because the threads are coarser and seem to hold better in the varying densities of bone. The screws do not go through the entire diameter of the shaft of the femur, but only through the cortex to which the plate is applied. During the operation the blood is removed by dry gauze sponges, but the tissues are not rubbed. No irrigation is employed. Under *no circumstances* whatever do the *fingers* ever *enter* the *wound*. The separated layers of muscles and fascia generally come together because they are under tension, so no sutures are required. Further, this method freely permits the escape of the oozing which is always present. The skin edges are brought together by interrupted black silk sutures which are put in place and tied with forceps. No drain is used. A very thick absorbent dry dressing is put on, and over this is applied a plaster case strengthened with wood or steel splints, extending from the toes to and embracing the pelvis. The patient remains upon the table until the case becomes solid.

After the strong plate has been most satisfactorily applied by snug screws to the shaft of the femur it would seem as if no motion were possible. If, however, moderate strain be applied to the leg, some motion at the fracture can be appreciated. If this be continued the screws will become loosened and the fragments disarranged. For this reason *no strain* must be permitted. The plate must be considered only of value merely to approximate the fragments and not at all sufficient to hold them. For this purpose the whole reliance must be placed upon the solid external plaster case, most accurately and carefully applied. If this does not succeed in absolutely immobilizing the fragments, the operation may fail.

Before undertaking such operations it is especially necessary to provide a distinct armamentarium, for success here depends so absolutely upon employing just the right instruments. It has been found very unsatisfactory to depend for

traction upon the efforts of our assistants, and frequently their combined strength has failed to reduce the fragments. I am sure that those surgeons who have had an extended experience all thoroughly appreciate the necessity of having powerful traction which can at any moment be applied or discontinued; it must be sufficiently flexible in its working to permit at first a small amount of traction, which later can be easily increased when more traction is required. During the last six months I have been using Dr. Lemon's extension apparatus and have found this of the greatest possible assistance in those late cases where, after several months had elapsed, there existed marked shortening, with rigidity of the muscles and the adjacent tissues. The leg is held steadily during the operation, and when it is completed, the plaster case can be easily applied without releasing the extension. It can also be maintained until the case becomes solid. This has given me great comfort in relieving my anxiety lest the fragments become displaced when the patient is first moved from the table after the operation.

There has been no mortality. In only one case was the plate removed and that was in one of my earlier cases, when I was somewhat apprehensive, but when I cut down to the plate the screws were solid and it would have been unnecessary. "If these statistics leave something to be desired, it must be remembered that these were cases picked as being too difficult for other forms of treatment and that our city hospital patients are frequently poorly nourished and of the worst habits." Operations performed under the above indicated methods have been followed by excellent results. If this is possible in the cases of old, long-standing difficult fractures of the femur, how much more easily and more quickly can it be done in recent cases and with how much greater safety and surety of securing an earlier and better functional result. Fractures of the femur comprise about 7 to 10 per cent. of all hospital fractures and are most difficult to treat. Surgeons are interested in establishing the best method of treatment for

the different special fractures. It now appears that sufficient evidence has been shown to definitely recommend operations for fractures of the femur, in such cases as reduction is inadequate. Adequate reduction requires that the ends remain in apposition without obvious angulation or axial rotation, and that the shortening be not greater than one-half inch. In every case, skilled efforts must be made to secure reduction at once after the accident. If these efforts are unsuccessful, they must be renewed under general anæsthesia. If adequate reduction is secured and can be maintained by traction, extension apparatus is applied. Further efforts to secure reduction by extension should not be continued after seven days, as it has been frequently demonstrated, that where over-riding

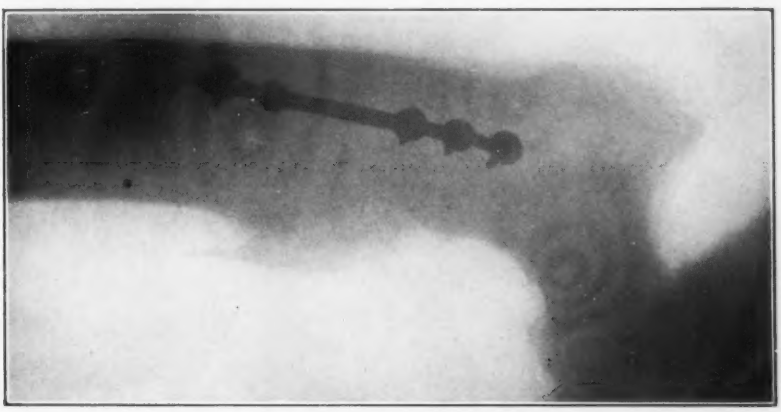
Case number	Year of operation	Age	Seat of fracture				Reduction attempted under anæsthetic	Extension applied	Cm. shortening	Angulation persisted	Rotation present	Days elapsed after accident before operation
			Neck	Upper third	Middle third	Lower third						
1	1900	40	..	..	+	..	+	+	5	+	+	420
2	1906	28	+	..	..	..	+	+	3	+	+	795
3	1907	12	..	..	+	..	+	+	4	+	+	39
4	1908	36	..	+	..	..	+	+	4	+	+	30
5	1908	48	..	+	..	..	+	+	4	+	+	60
6	1908	52	..	..	..	+	+	+	3½	+	+	98
7	1909	40	..	..	+	..	+	+	4½	+	+	47
8	1909	10	..	+	..	..	+	+	2½	+	+	13
9	1909	11	..	..	+	..	+	+	3	+	+	14
10	1909	16 mos.	..	+	..	..	+	+	2	+	+	485
11	1910	42	..	+	..	..	+	+	4	+	+	6
12	1910	60	..	+	..	..	+	+	2½	+	+	14
13	1911	43	..	..	+	..	+	+	4	+	+	10
14	1911	50	..	+	..	..	+	+	3	+	+	5
15	1911	36	..	+	..	..	+	+	5	+	+	7
16	1911	50	..	..	..	+	+	+	3½	+	+	31
17	1912	34	..	+	..	..	+	+	3	+	+	35
18	1912	12	..	..	+	..	+	+	2½	+	+	37
19	1912	50	+	..	..	..	+	+	2	+	+	325
20	1912	34	..	..	..	+	+	+	7	+	+	193
21	1912	57	..	..	+	..	+	+	3	+	+	78

There has been no mortality or serious complications; in only one case has the plate been removed, No. 8. Improvement has resulted in every case.

FIG. 1.

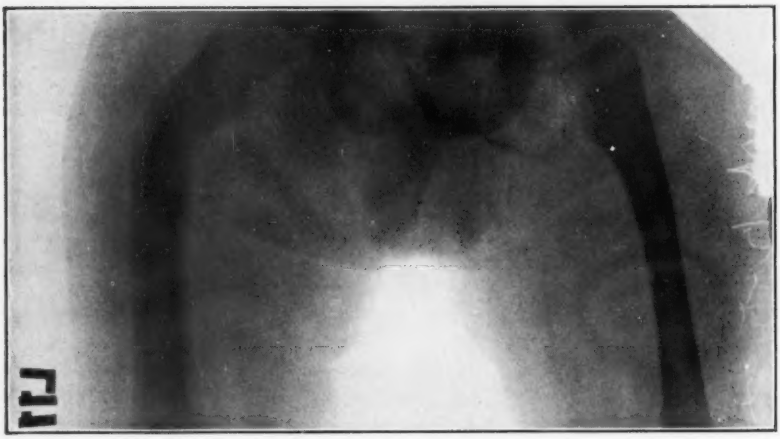
Femur, upper third. (Case XI A.)

FIG. 2.



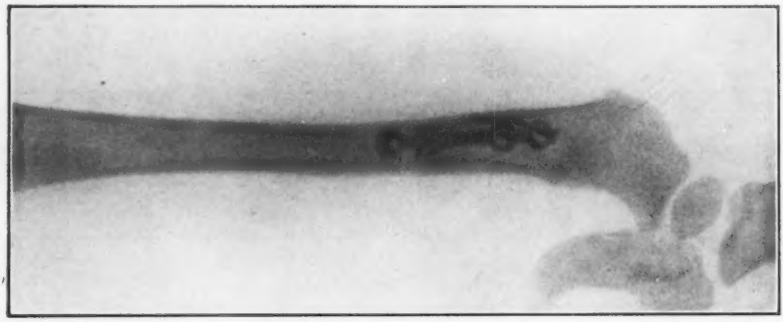
Femur, upper third. X-ray taken two years after operation. Normal function regained within one year after operation. (Case XI B.)

FIG. 3.



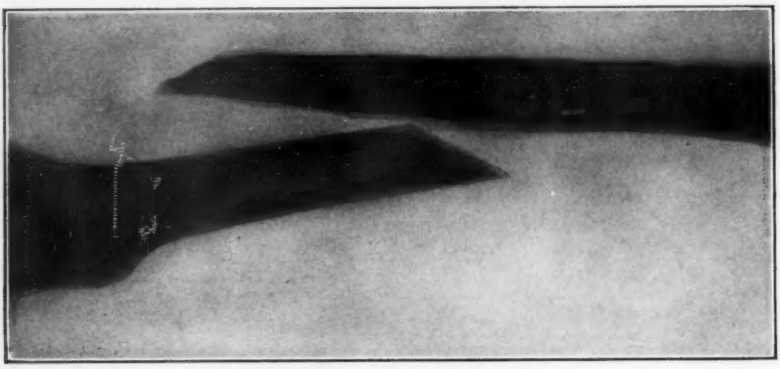
Femur, upper third. (Case X A.)

FIG. 4.



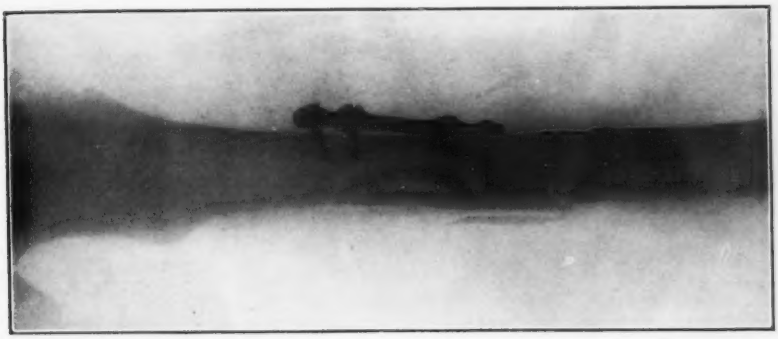
Femur, upper third. X-ray taken two years after operation. Normal function regained within one year after operation. (Case X B.)

FIG. 5.



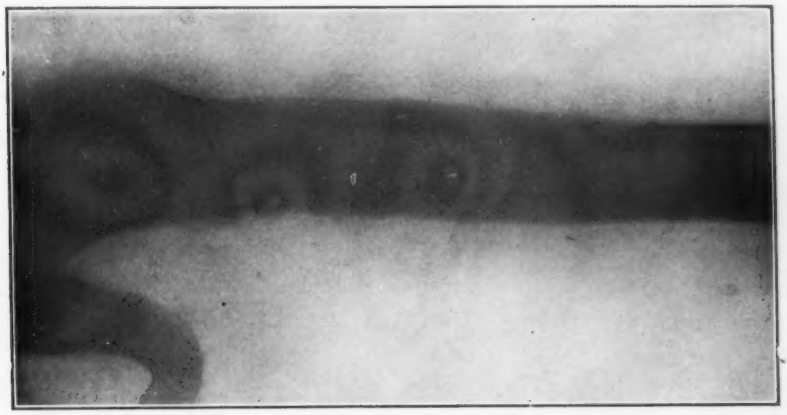
Femur, middle third. (Case VIII A.)

FIG. 6.



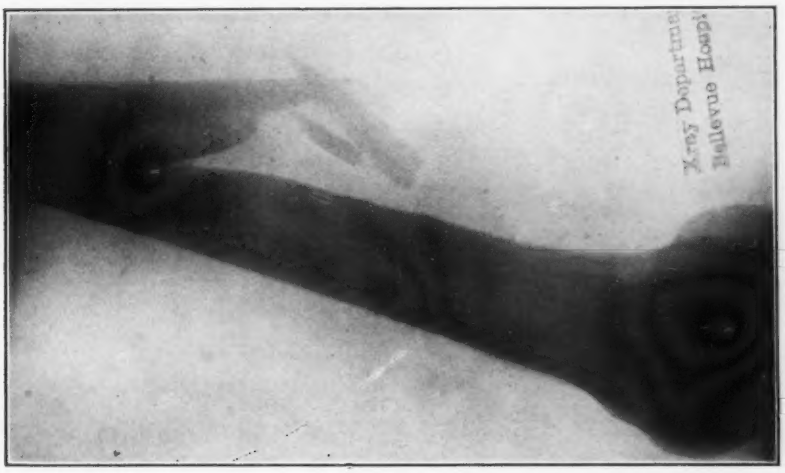
Femur, middle third. One month after operation, slight superficial suppuration plate removed. Normal function regained within six months after operation. (Case VIII B.)

FIG. 7.



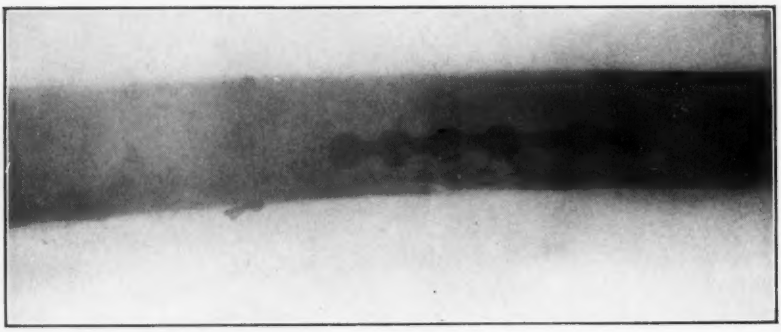
Femur, middle third. X-ray taken three years after operation. Case VIII C.)

FIG. 8.



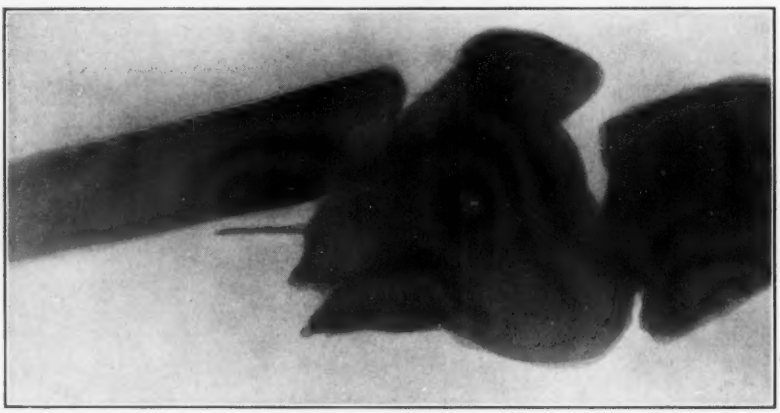
Femur, middle third. (Case XIII A.)

FIG. 9.



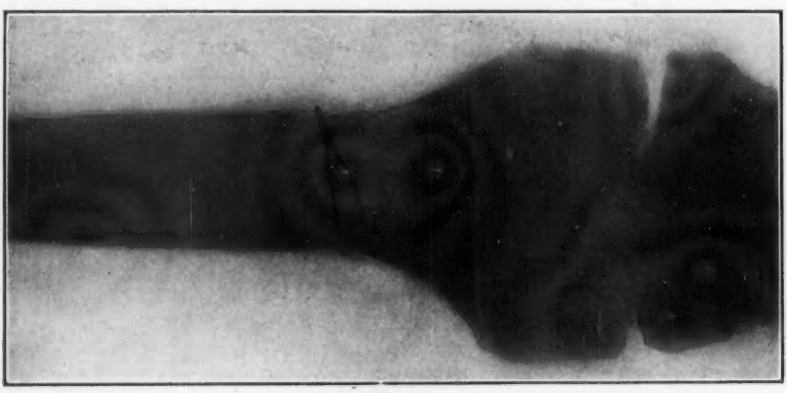
Femur, middle third. X-ray taken one year after operation. Normal function regained within four months after operation. (Case XIII B.)

FIG. 10.



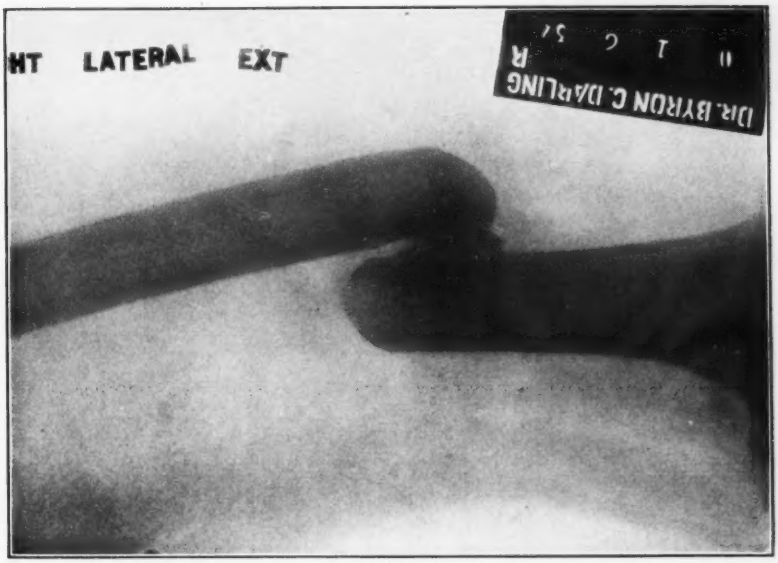
Femur, lower third. (Case VI A.)

FIG. 11.



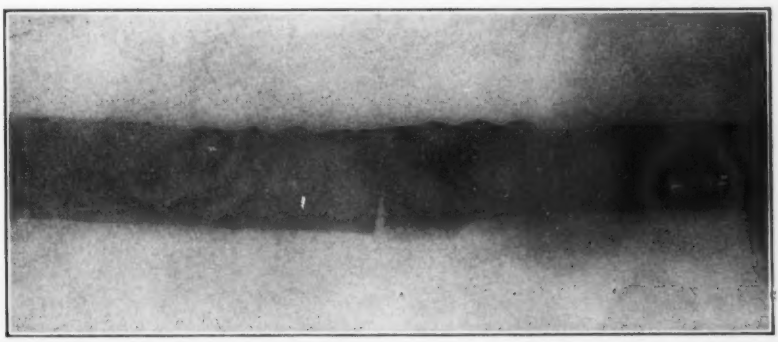
Femur, lower third. X-ray taken one year after operation. Function much improved within one year after operation. (Case VI B.)

FIG. 12.



Femur, lower third. (Case XX A.)

FIG. 13.



Femur, lower third. X-ray made six weeks after operation; primary union. Patient on crutches in hospital. Result excellent. (Case XX B.)

could not be pulled down in that time, no benefit could be gained by longer traction. Repeated violent attempts have caused more traumatism to the tissues than the operation itself. Some observers have stated that distinct changes occurred early in the ends of the fragments which caused delayed union as the bone channels became blocked up with lime salts.

CONCLUSIONS.—1. In fractures, the rapidity of union is proportional to the accuracy of reduction and the retention of fragments; delayed union is very largely due to faulty adjustment.

2. Plating the fragments does not increase the nutrition, but it brings the fragments into early intimate contact.

3. "As our experience grows we will be able to select after a study of the X-ray plates those cases in which operation is indicated." This will save the patient loss of time in trying extension, and will also render the operation easier, safer, and surer.

The accompanying illustrations represent the typical class of cases which demand operation in order to obtain the most satisfactory results.

CONTRIBUTION TO THE ETIOLOGY OF CONGENITAL DISLOCATION OF THE HIP.*

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Two brothers, John T. and Carl P. Jones, practising physicians in Glass Valley, California, found each a case of double dislocation of the femur, the one in a nine months' fetus, stillborn, the other in a living child which came into the world in a miscarriage at seven months and which lived but an hour after birth. The Doctors Jones deserve great credit for having made the diagnosis of congenital dislocation of the hip at birth and for having saved the material with much difficulty for investigation. I wish to express my great indebtedness to them for the privilege of studying these joints. If similar care in examining the newborn and children cast into the world prematurely were generally exercised, many of the vexed questions regarding the etiology of congenital dislocation of the hip would be speedily solved.

CASE I.—The mother is a large, healthy, hardworking woman, who has had four normal children living and two stillbirths at term. Of the first stillbirth there is no record of examination; the child died shortly before birth. The second stillbirth terminated the fifth pregnancy at nine months and a half. It was a dry birth with breech presentation.

This child was a female and weighed eight and a half pounds; the cord presented no irregularity; the lower half of the body only was preserved. It showed the following deformities: Dislocation of both hips upward and backward, bicornate, or, rather, bified uterus, imperforate anus and vagina, large clitoris corresponding to the male urethra, not certainly communicating with the bladder. The sigmoid and rectum were distended with meconium, the latter opening between the two horns of the

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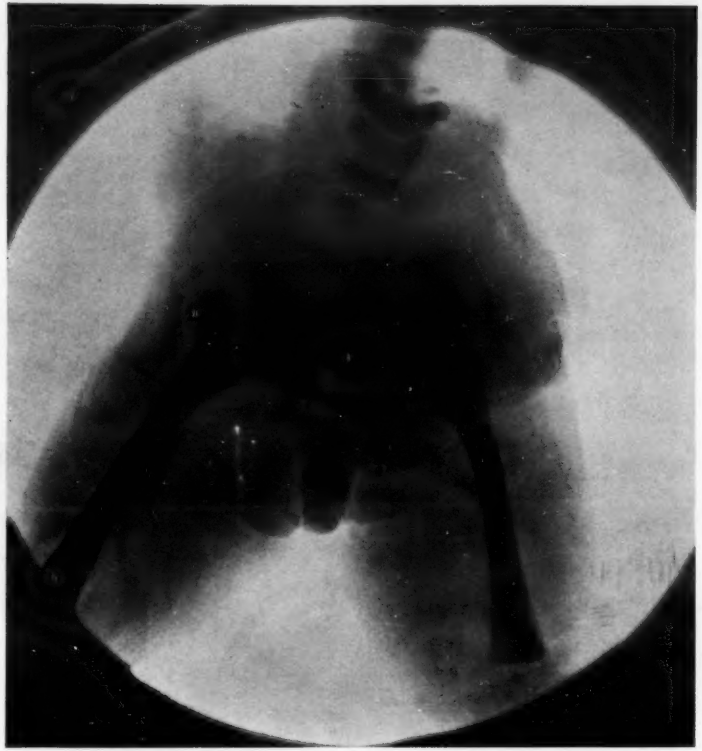
FIG. 1.

Female fœtus of nine months with congenital dislocation of hip, showing position of lower extremities *in utero* pes equino-varus (right), calcaneo-valgus (left). (Case I.)

FIG. 2.

Position of extremities *in utero* of seven months male fœtus with congenital dislocation of the hips, showing genu recurvatum carpus recurvatus, pes equino-varus. (Case II.)

FIG. 3.



Radiograph of double congenital dislocation in female fœtus at term. (Case I.)

FIG. 4.

Radiograph of pelvis and lower extremities in Case I, showing relations of femora to pelvic bones in flexion. Note the mesial position of the fibulæ as in monster of siren type, internal rotation not having been completed.

uterus into the bladder by a minute aperture the size of a bristle; the bladder was large and thick-walled; a rudimentary vagina on each side also opened into the bladder by an opening large enough to admit an ordinary probe; the right half of the uterus, Fallopian tube, ovary, round ligament, and ureter were normal; the left half of the uterus, rudimentary, but the ovary, tube and round ligament substantially normal.

The position assumed by the lower extremities in flexion on the abdomen, the legs crossed in front, with both knees flexed, is within the range of the normal position of the extremities in utero. Both feet showed evidences of abnormal pressure, the left being dorsally flexed over the right knee with its sole presenting to the uterine wall. It was therefore in a position of calcaneo-valgus. The right foot, presenting its dorsal surface to the uterine wall, was in slight varus position (Fig. 1).

Although when seen by me this specimen had been in weak spirit for some weeks, and therefore showed considerable rigidity of the muscles, the head of the femur could be slid about in various directions on the dorsum of the ilium, for a distance of almost a centimetre, but abduction was markedly limited. When forcibly extended and then released, both thighs spontaneously resumed their position of flexion.

Before dissection, both dislocations were readily reduced, as in the Paci-Lorenz operation after section of the adductors, and the position in reduction was apparently more stable than after reduction in the ordinary case in children of two or three years of age, the acetabulum being relatively more competent.

The Right Hip-joint.—The capsule was stretched upward and backward, and when opened showed a crescentic band with sharp edge, dividing the capsular cavity into two portions, the inner, smaller than the outer, in which rested the head of the femur. A probe could be passed beneath this fold to a depth varying from zero below to 5 mm. above. The aperture at the point of construction formed by this fold, 7x11 mm. in diameter, was amply large to admit the head of the femur (see Fig. 5).

Though the head of the femur was readily moved about, and therefore had no single point of rest, the position generally assumed by the head of the femur on the dorsum of the ilium when the thighs were flexed was 13 mm. from the centre of the acetabulum, and 20 mm. from the anterior superior spine, while

the centre of the acetabulum was 20 mm. from the spine. Reconstructing this triangle, it will be seen that the position of the head of the femur when at rest, as in the position of the extremities in utero, was upward and backward, a very considerable distance from the acetabulum.

The rim of the acetabulum, bereft of its cotyloid, was gently rounded, even to overhanging, the cavity being largely occupied by soft tissue continuous with the lower and posterior portion of the capsule, its horizontal diameter 5 mm., vertical, 7 mm., depth, 4.5 mm.

The head of the femur was almost exactly hemispherical, diameter, 9 mm.; ligamentum teres present and intact, but drawn out into a mere thread, perhaps 0.5 mm. in diameter; it was ruptured accidentally before the photographs were taken, but its remnants may be seen in the photographs projecting from the head of the femur and as a light spot in the centre of the acetabulum (Fig. 5).

Torsion.—Without destroying the specimen, it was not possible accurately to measure the angle of the femoral neck with the plane of the posterior border of the condyles at the knee, as was done, for example, by Paul Graf (*Beit. z. klin. Chir.*, 1909, Band lxiv). Roughly, this angle was estimated by passing a flat instrument through openings in the skin, and pressing it against the posterior surfaces of the condyles, and sighting across another instrument laid above the neck of the femur. By this crude means, the angle was estimated as 25 degrees of anterior torsion.

Left Hip-joint.—As on the right side, the head of the femur rested on the dorsum of the ilium at a point 12 mm. from the centre of the acetabulum; 15 mm. from the anterior superior spine, while the distance from the spine to the centre of the acetabulum was 20 mm.

As on the right side, the upper part of the capsule rested on a portion of the glutæus minimus muscle, which has been folded beneath it and therefore could be moved anteroposteriorly through several millimetres.

Acetabulum.—Horizontal diameter, 7 mm.; vertical, 9 mm.; depth, 4.5 mm. The rim, bereft of cotyloid, edges rounded, slightly overhanging; a crescentic fold of capsule with sharp edge projecting into the cavity on the posterior side; a probe

FIG. 5.

Congenital dislocation of the right hip in nine months female fœtus, showing small acetabulum with overhanging edges, remnants of thread-like ligamentum teres, crescentic fold of capsule remnants of gluteus minimus muscle between capsule and ilium. (Case I.)

FIG. 6.

Left hip in nine months female fœtus with congenital dislocation, showing broad and thick ligamentum teres. (Case I.)

U of M

FIG. 7.

Showing thickness of ligamentum teres and the small acetabulum with overhanging edges. (Case I.)

entered about 1 mm. beneath it. There was no other suggestion of an hour-glass contraction of the capsule, and this was insignificant and quite comparable to a similar fold sometimes seen in the normal casule.

The head of the femur was nearly hemispherical, its vertical diameter 10 mm., horizontal, 9 mm., with a slight flattening posterior margin of condyles about 20 degrees forward; ligamentum teres very large and flat, and with sharp edges; its lateral diameter varied from 5 to 8 mm., and it was 1 mm. or more thick. With the thigh flexed upon the abdomen, the ligamentum teres lay straight and flat across the acetabulum, for the most part filling its cavity, but when the thigh was extended it showed a corresponding twist (see Fig. 6). The ligamentum teres was free of the neck of the femur and the fold of Amantini.

CASE II.—The mother is a large, normal, healthy woman, who has been pregnant three times; in the first pregnancy, the child was born normally and lived. The second pregnancy was interrupted at six months and one week. No data are available concerning the cause of the miscarriage nor the condition of the child. In the third pregnancy at three months, the mother, living in an isolated farmhouse, was terribly frightened by some drunken ruffians who tried to enter the house. After this, she began frequently to lose a little blood, at times a great deal. In spite of rest in bed, this discharge continued, and at six months amniotic fluid mingled with the blood. At seven months spontaneous miscarriage occurred. The cord was knotted six inches from the child's navel, but not strangulated. The birth was absolutely dry, a vertex presentation. The child breathed, and though not particularly cyanotic, lived but an hour. As soon as free of the mother, the thighs of the child spontaneously flexed, and the left leg took the position of hypertension with toes pointing backward and downward, and the right leg flexed, the toes pointing upward, both legs lying on the left side of the body. Immediately after death, the child was examined by Dr. Jones, who found the dislocated hips, and the genu recurvatum (see Fig. 2).

Body of male child in weak spirit, weighing 1120 grammes, normal in every respect, except as to hips, left knee, and left wrist. The testes were free in the abdomen, the processus vaginalis patent on each side as far as the upper part of the

scrotum. There was present congenital dislocation of both hips, genu recurvatum on the left side, and carpus recurvatus on the left; other large joints normal. For radiograph see Fig. 8.

Left Hip-joint.—The head of the femur lay on the dorsum of the ilium, its centre 8 mm. from the centre of the acetabulum, and 10 mm. from the iliac spine. Distance of anterior superior spine from centre of acetabulum, 15 mm. No fold of capsule present, suggesting hour-glass contraction.

Acetabulum.—Edges rounded, bereft of cotyloid; horizontal diameter, 6 mm.; vertical, 5 mm.; depth, 4 mm. Head of femur almost perfectly hemispherical, 9 mm. in diameter, with perceptible flattening under the ligamentum teres.

Ligamentum teres present, flat, 6 mm. wide at widest part, 1 mm. or less thick, free of the neck of the femur. It lay flat on the ilium when the femur was flexed, but twisted when the femur was extended. Angle of neck of femur to plane of condyles about 45 degrees forward.

Right Hip-joint.—The head of the femur lay on the dorsum of the ilium, at a point 10 mm. from the centre of the acetabulum and 10 mm. from the anterior superior spine; distance of spine from centre of acetabulum, 15 mm. Acetabulum as on the left side, without cotyloid, a slight fold in posterior part of capsule suggesting beginning hour-glass contraction. Angle of rotation of neck of femur to plane of condyle, about 45 degrees forward.

Case III.—Acardiac monster, without external sexual organs or anus. A museum specimen, an almost shapeless lump of fat, with undeveloped upper extremities, but with backbone, pelvis, thighs, and legs, with toes rudimentary and feet showing constrictions of amniotic bands. The thighs could be extended 30 or 40 degrees and rotated slightly. A radiograph (Fig. 9) showed on the left side relations ordinarily looked upon as typical of congenital dislocation of the hip. The hips were therefore exposed by incisions around the crests of the ilia. The hip-joints were poorly developed, the capsule not fully differentiated. On the dislocated side, the joint, as a whole, was displaced upward, so as to lie just behind and in contact with the anterior superior spine of the ilium. The acetabulum was represented by an ill-defined cup; the head of the femur, by a rounded knob (Fig. 11). Capsule, cartilaginous; ligamentum teres, not differentiated.

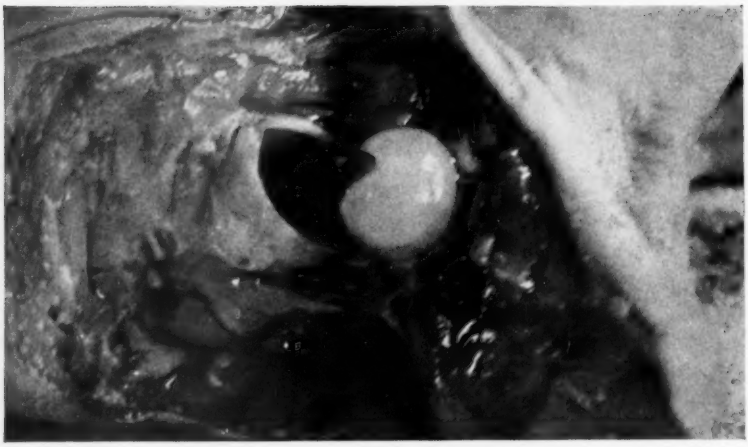
FIG. 8.

Radiograph of congenital dislocation of the hip (double) in seven months male fœtus. Left genu recurvatum. (Case II.)

FIG. 9.

Radiograph of acardiac monster showing displacement of left hip-joint. (Case III.)

FIG. 10.



Normal hip-joint in six months fœtus (male).

FIG. 11.

Displaced and undeveloped hip-joint in acardiac monster. Amniotic constriction of lower extremity. Note relations of hip-joint to anterior superior spine and sacrosciatic notch. (Case III.)

The joint seemed to be little more than a hemispherical slit in the joint cartilage.

It is customary to consider the many theories of the origin of the congenital dislocation of the hip as divisible into two groups; the one in which the explanation is sought in a primary defect of embryonic form (von Ammon); the other, in which the phenomenon is looked upon as the result of some mechanical cause acting upon substantially normal but exceedingly plastic and easily modified structures. There is difficulty in accounting for the singular uniformity of findings in congenital dislocation of the hip as observed clinically on the basis of a primary embryonal defect, but it is thought by many that these clinical findings are rather the results of later development, made possible by the supposedly essential primary cause. The advocate of the mechanical cause, on the other hand, would consider the lack of development as a sequence of altered function, itself secondary to the displacement. If the developmental idea is correct, one would expect to find congenital dislocation of the hip definitely hereditary, to show evidences of the trouble in the earliest months of fetal life, and later to present great variation in form, and to resist restoration after reduction. If it is not due in any sense to the anatomical peculiarities of the human, one would expect to find it in the lower animals.

Advocates of developmental theories are Hoffa, Bade, Wollenberg, Schede, Vogel, Kirmisson, Kroenlein, Wolff, Hagen-Torn (I quote Paul Graf); and of the mechanical theories, Lorenz Lange, Ludloff, Heusner, Hirsch, Deutschlaender, Schanz, Reimer, Ewald, and Dreesman, while Le Damany, one of the most assiduous of the investigators in this field, takes a middle ground, making a sharp distinction between the dislocations which are common in monsters and in the presence of other congenital defects incompatible with life, called by him "teratological dislocations," and those which occur in viable individuals, "anthropological dislocations," which he would look upon as a part of the sacrifice humans

make to the upright position and the long thigh. The former are clearly developmental defects, occurring very early in fetal life; many of them really displacements of the imperfect joint as a whole, which, of course, have nothing to do with the congenital dislocation of the hip as we know it clinically. Such a displaced joint is illustrated in Case III, in which the capsule has not been differentiated (see Fig. 11). Le Damany called attention to the frequent intermediate cases, which prove, as he says, a certain connection between the types. But this very inter-relation is quite as strong an argument for a mechanical theory of causation as for an embryological one, for even the sorriest monsters often have pelvis and thighs, and are subject, therefore, to mechanical influences. Le Damany would have it that the anthropological dislocations occur gradually, either late in fetal life, or after birth, even after the child begins to walk.

Hoffa considered that the X-ray, showing as it does, even in the sound hip in unilateral dislocations, evidences of lack of development, proved the contention that lack of development was the fundamental cause of the dislocation, but when one comes to consider that the X-ray records merely the relation of the areas of calcification at a given time, and that the areas of calcification in the pelvis are far from the acetabulum at the time that the dislocation is produced, actually or potentially, it is difficult to see that the X-ray aids very much, except in recording relations which may better be looked upon as effects of the displacement.

If the principal cause of congenital dislocation is mechanical, it would seem to be possible of determination. No doubt, that it has not been demonstrated is due to the paucity of cases subjected to anatomical study at a sufficiently early date. It is often stated that to make the diagnosis of congenital dislocation of the hip in the fetus or in the newborn child is very difficult. The fat of the child, the flexibility of its joints, the weakness of its muscles, make it very difficult to measure the length of the limbs and to determine the relations of the trochanters to Nélaton's lines, and to estimate the limitation

of abduction. All the other motions of the hip are practically normal in the young child with congenital dislocation. There is one sign to which I have not seen attention called, and which I believe is always present and always to be elicited, namely, the capacity of the head of the femur in congenital dislocation to slide on the ilium.

There is no doubt that the dislocation takes place gradually, that the capsule stretches to accommodate itself to the pressure which is generally upward, or upward and backward. The capsule is folded upward on the ilium, but takes with it the reflected tendon of the rectus femoris and the glutæus minimus muscle to which it is attached. The extreme lower part of the upper limb of the capsule may fix itself on the bone above or behind the acetabulum, but the upper part of the capsule, that which surrounds the head of the femur, is separated from the bone by the reflected tendon, and part of the glutæus minimus muscle. It therefore is not fixed, and hence the head of the bone may slide or roll in many directions. It slides within the large capsule and the upper part of the capsule slides on the bone by reason of the cellular and muscular planes between. At least, this is the fact in all four joints herein described, and the remnants of the glutæus minimus muscle can be seen in some of the photographs.

To elicit such sliding, the child or fetus is placed on a hard table on its back, with thigh flexed to a right angle, and the knee flexed on the thigh to relax the hamstring muscles. With one hand, the pelvis is fixed, while with the other the thigh is alternately pulled and pushed in the direction of its shaft, that is, antero-posteriorly with reference to the pelvis. The sliding movement of the head of the femur is then readily detected. While this mobility persists for several years in unreduced dislocations, it is greater in degree in the very young before the head of the femur has had time to come to a position of final rest on the dorsum of the ilium, and to bore its way through the capsule and underlying muscle into contact with the bone, there setting up an irritation which results in the formation of a false acetabulum. In making this test, care

should be taken to grasp the femur by the condyles, else the laxity of the infant knee in flexion may give a false notion of mobility.

I feel confident that if obstetricians would systematically examine the hips of the newborn for this abnormal mobility and for the limitation of abduction, most of the cases of congenital dislocation of the hip would be diagnosticated at birth, instead of, as at present, only after the child has been walking for some time, and that potential dislocations, "luxabilitiès" of Le Damany, would be detected, perhaps in time to prevent further displacement. Of course, unilateral dislocations are often made out earlier than double, by reason of the asymmetry of the thighs, but these would be all the easier made out at birth by the difference in mobility between the two sides. Such systematic examination at birth for the dislocation would settle the question of the frequency of the occurrence of the dislocation after birth, but the relation of primary developmental defects to the dislocation requires for its determination the systematic investigation of a large number of fetuses at various ages, presenting this deformity. Unfortunately, such material is exceedingly scarce, for the reason that there is nothing in congenital dislocation of the hip which is incompatible with life, and in those cases in which the fetus dies, other deformities are apt to be present which have determined the death, and which would put the case into Le Damany's class of "teratological dislocations," difficult to compare with the cases which we see clinically.

It is not clear that diagnosis of congenital dislocation at birth would be of material assistance in the treatment of the deformity, but at least it would be an interesting experiment to reduce the dislocated hip and to effect retention by means of some simple abduction splint. In favor of such an experiment is the greater probability of normal development of the structures of the joint when they are thus early restored to their normal relations.

Congenital dislocation of the hip is an extraordinarily common deformity. Le Damany would have it that there are

100,000 cases in France, if the proportion of 1 to 3000 of population, determined by him for the provinces of Brittany and Vosges, holds throughout the country. While we have no figures for America comparable to these, the general impression of a number of surgeons with whom I have talked on the subject is that the frequency in this country is far less, and decidedly less than that of clubfoot. Still, it may be safely stated that it is a fairly common deformity in this country. If Le Damany's notion of the occurrence of this dislocation after birth, and as a result of the erect position, is correct, possibly the great frequency of the dislocation in France may be accounted for in some measure by the custom in that country of forcibly extending the newborn infant's thighs and holding them in the extended position with swathes (maillot), a manœuvre which puts the flexor muscles of the thigh on tension, and develops a continuous force in an upward direction on the head of the femur. It is conceivable that in cases "predisposed to luxation," such force would cause a gradual wandering of the head of the femur upward and backward. By cases "predisposed to luxation" are meant cases such as are described by Le Damany, who, in examining 1674 young children, found no luxations, but 23 "luxabilitiès" single and double, that is, cases showing radiographically deficient acetabula, or a more than normally obtuse angle of the area of calcification at the upper border of the acetabulum. It is certainly conceivable that in such cases of potential dislocation, persistent holding of the thighs in extension by external means, followed by efforts at walking, may produce displacement upward and backward by the gradual stretching of the upper part of the capsule. Some conception of how little force persistently applied is required to produce dislocation of the hip in the plastic joints of the fetus or of the newborn may be gotten from the well-known readiness with which spontaneous dislocation of the hip occurs, even in adults, in cases of paralysis of the muscles about the hips.

But the potential dislocation has yet to be explained. As said above, the X-ray gives no information as to early con-

ditions. It is more than probable that the forces which stretch the capsule in utero, in some cases will do so to such an extent as to produce a complete luxation; in others, only to the extent of permitting the head of the bone to rest on the upper edge of the acetabulum. Such cases might properly be described as potential luxation, but they would not exhibit demonstrable shortening of the femur, or detectable displacement of the trochanter, and the limitation of abduction would be so slight as to escape detection. They would almost certainly exhibit the phenomenon of lateral sliding, however, to a perceptible degree.

The extraordinary frequency of the occurrence of other congenital deformities concomitant with dislocation of the hip is the principal ground of argument for the developmental theory of origin. Asymmetry of the pelvis, spina bifida, clubfoot, absence of the patella, syndactylism, harelip, luxation of knee, genu recurvatum, club-hand, hernia, cleft of abdominal wall, bicornate uterus, imperforate anus, intellectual inferiority, and many others have been observed. But the frequency of clubfoot, which is generally of the equino-varus variety, is far greater than all of the other deformities combined, and is very definitely a pressure phenomenon. It is by no means certain that genu recurvatum, absence of the patella, asymmetry of the pelvis, luxation of the knee, and even spina bifida and some of the other deformities, are not the result of abnormal pressure or of restriction of the available space in which the fetus has to grow, for skin, and muscle, and bone defects occur in many parts of the body, demonstrably the result of such pressure, " Belastungs Deformitäten." Le Damany found 1 case in 50 of congenital dislocation of the hip to have some other congenital deformity and 1 in 66 to have clubfoot. If to clubfoot are added the other pressure deformities it is evident that the proportion of occurrence of congenital defects definitely referable to primary defects in the embryo is not so much greater in those suffering from congenital dislocation of the hip in the general population as commonly supposed.

One point difficult to explain on the basis of primal embry-

onal defect is the fact that after reduction of a dislocation the acetabulum and the head of the femur go on and develop, and the final result is a joint but little removed from the normal. In fact, it is commonly held that the success of the modern treatment of congenital dislocation of the hip definitely disproves the von Ammon theory.

The flattening of the head of the femur, the development of the false acetabulum, much of the rotation forward of the neck of the femur, non-development of the acetabulum, contracture of the abductor muscles, hour-glass contraction of the capsule, lengthening of the ligamentum teres, and absence of the same, so often met with in older children, scoliosis, which is marked in unilateral cases, etc., are all explainable as secondary phenomena, the result of pressure and of altered function in walking. Since these secondary phenomena to a great extent complicate our treatment, the desirability of early diagnosis would seem to be evident.

Le Damany's notion, that the long femur finds a fulcrum on the anterior superior spine of the ilium, is opposed by Paul Graf (*loc. cit.*), who made an exhaustive series of measurements in 111 fetuses and young children, and established the normal relations of the structures about the hip-joint, and who found that the femur would not impinge on the anterior superior spine, but that the fulcrum—if there is one—must be the abdominal wall and other soft parts. It matters little for the theory where the fulcrum is, so long as it exists, but while such a leverage would account for a forward stretching of the capsule, it would not furnish a vertical component of force tending to displace the head of the bone upward; nor a horizontal component, directed backward.

In the two fetuses here described, the stretching of the capsule was much greater in the upper portion, and definitely occurred in utero. There were many evidences of excessive intra-uterine pressure, particularly on the knees and feet.

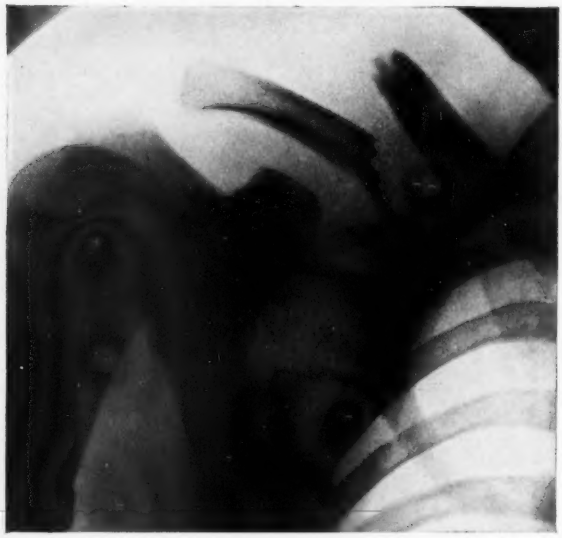
It would seem that some additional force must be found to account for the vertical displacement. Forcible extension of the thighs after birth will not answer in these four joints, for

that would have left evidences of trauma, and there were none, and the capsules were nowhere attenuated, but had evidently accommodated themselves to the stretching, which must therefore have been a gradual process while the fetuses were still alive. Such a force might be found in the efforts of the child itself in utero in straightening its back—efforts of extension of the pelvis. Little is known of the movements of the fetus in utero, but with the uterus pressing on the knees, it is evident that little movement would be possible to the legs and thighs. With any resistance to downward pulling of the thighs—a rigid uterine wall, small fibroid, legs in extension, feet caught over arms, or forehead, or shoulder, or amniotic folds—extension of the pelvis would develop a force pulling the pelvis away from the femur, that is, a force tending to stretch the capsule and displace the head of the femur upward and backward. Such a force would be a pull transmitted along the length of the femoral shaft, and therefore largely in the direction of the upward displacement. Furthermore any theory based upon such a force would not be subject to Vogel's objection to leverage notions that if the long femur were a lever transmitting force enough to stretch the capsule, it would bend.

I would simply offer this as a suggestion, which, if established, would account for the upward displacement, but it is not necessary to assume that the fetus in utero is active in dislocating its own hips, for with the growth of the spine in length, the very marked convexity of the spine of the first two or three months of gestation becomes rapidly less, and such a straightening of the spine would of itself develop forces acting in these directions.

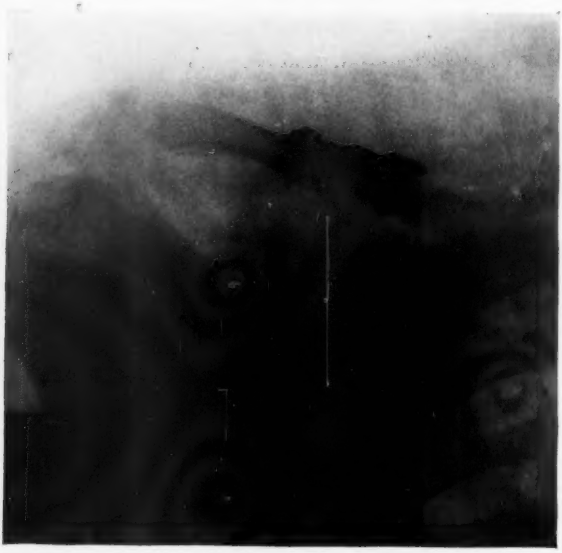
The slightly greater development of the female pelvis in utero, the more vertical inclination of the plane of the acetabular ring (Graf), might under such force furnish the slight anatomical difference required to account for the greater frequency of congenital dislocation of the hips in the female sex.

FIG. 1.



Original fracture of clavicle, showing displacement of fragments. Note marked separation between ends of bone.

FIG. 2.



Clavicle after operation, showing plate in position. Shadow cast by plate on anterior surfaces hides second plate inserted on lateral aspects of bone. Biograph taken through plaster-of-Paris cast.

BONE PLATING IN IRREDUCIBLE FRACTURE OF THE CLAVICLE.

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THE open treatment of fractures in general, together with certain atypical fractures subjected to this form of surgical attack, has prompted the present communication. Instances of clavicular fracture in which separation of the fragments is so marked as to preclude the possibility of treatment by the closed method are not rare. Yet such examples are not by any means common. Surgeons who have had opportunity to study and operate upon rather large series of cases report but a small percentage involving the clavicle.[1] It has been said by at least one observer of large experience, who has devoted particular attention to the treatment of fractures, that "clavicle fractures do not call for operation ever, so far as I know."[2] As an example of a somewhat unusual type of fracture, because of the marked separation of the fragments, the following case is presented:

R. A., aged 15, a farm hand, was brought to the Albany Hospital on May 8, 1912, with the following history: On May 5, while attempting to get on a buckboard, he slipped and fell to the ground, striking on the point of the left shoulder. He did not see a physician until the following day (May 6), at which time, under ether anæsthesia, an attempt was made to reduce the fracture of the clavicle, diagnosed as such by the attending physician. Efforts in this direction were unsuccessful, and on May 8 the boy was brought to the Albany Hospital, at this time presenting the typical picture of fractured clavicle. Examination revealed a marked separation of the fragments, as can be seen

[1] Blake: Surg., Gyn. and Obstetrics, April, 1912.
[2] Cotton: Trans. Mass. Medical Society, June, 1911. (Reprint.)

from the accompanying photograph (Fig. 1), the radiograph being taken shortly after the boy's arrival at the hospital. In view of the clinical evidence, supplemented by the radiographic findings, the case was deemed a suitable one for plating. On May 9 the latter was performed, two intersecting incisions being made over the fractured fragments. Insertion of the first plate, made directly over the anterior surface of the clavicle, was followed by a partial sagging of the two portions of bone thus brought in apposition, due to the muscular tension exerted. To overcome this defect a second plate was inserted on the upper lateral surfaces, producing the desired apposition. A small cigarette drain was introduced, the soft tissues loosely united with a few catgut sutures, and the wound closed with silkworm gut stay sutures and catgut. The arm and shoulder were enclosed in a plaster-of-Paris Velpeau bandage. At the end of 48 hours the drain was removed, and after a period of eight days the stitches were treated likewise. Primary union was perfect, and at the end of four weeks the plaster was cut down, passive motion and massage being begun at this time. Recovery was uneventful. The patient was discharged at the end of five weeks, having at this time perfect motion of arm and shoulder.

Our experience in this case prompts us to the belief that small, light bone plates in fractures such as the above are indicated rather than the use of kangaroo tendon, silver wire, chromic catgut, and other mechanical devices in the treatment of this type of fracture. Although Blake,[3] in a series of 106 operations, reports five clavicular fractures, three of which were sutured with chromic catgut and two with bronze wire, yet Ochsner and Percy[4] have substituted the Lane plate in their recent operations for wire and catgut previously used. In our own case, as in others since, the use of the modified Lowman-Lambotti bone clamp has been found to be of great help in approximating the fractured portions of bone. The old type of Lane steel plate used in this case has since been discarded in favor of the vanadium plate and screws as described by Martin, and the original Lane screw driver has been superseded in our work by the combination holder and screw driver advocated by Sherman.

[3] Blake: Surg., Gyn. and Obstetrics, April, 1912.
[4] Ochsner and Percy: Clinical Surgery.

TRAUMATIC SEPARATION OF THE LOWER EPIPHYSIS OF THE FEMUR.*

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OF NEW YORK,

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THE lower femoral epiphysis is the first epiphysis to appear and the last to unite. Ossification begins in the second or third week before birth, it being the only epiphysis in which ossification does appear before birth with the exception, rarely, of the upper osseous nucleus of the tibia.

Separation of the epiphysis may occur at any time from birth to the twenty-first year, at which time union with the diaphysis usually occurs. Madame La Chappelle reported a case of separation of the epiphysis at birth from traction upon the feet during a breech extraction, and Hilgenreiner reported a case in which it occurred at the age of twenty-one, it having occurred previously at the age of four in the same epiphysis of the same individual.

The lesion is about six and a half times more frequent in the male, usually occurring between the years of 13–18 according to Poland, and between the years of 8–18 according to Hilgenreiner.

As regards the frequency: Bruns, in a table of 100 epiphyseal separations, reported 28 separations of the lower epiphysis of the femur. He regards it as the most frequent of epiphyseal separations, and thinks it frequently unrecognized when there is slight or no displacement, which statement is strongly supported by the fact that it is the largest epiphysis, the first to appear, the last to unite, and is the fulcrum, as it were, of a lever when either the leg or thigh is fixed and this at an age of great activity.

In my own experience during recent years, since the introduction of the gasolene engine and the perfection of the

* Read before the New York Surgical Society, October 23, 1912.

X-ray, I have been strongly impressed with the frequency of separations of the lower radial epiphysis. I believe that if systematic radiographs and careful studies were made of all injuries around the wrist-joint, separation of this epiphysis would be found to be more frequent than that of the lower end of the femur, and that many cases classed as Colles's fractures would be placed under their proper heading.

Poland collected 114 cases of separation of the lower epiphysis of the femur. Hilgenreiner collected 194, including those collected by Poland, to which he adds six of his own, making 200 cases to May, 1909. I have been able to collect eight additional cases. My own case I will report in full. Abstracts of the others will be given at the end of this article.

Alfred R., age five, admitted to Dr. Brewer's service in Roosevelt Hospital, November 9, 1911, discharged January 10, 1912. About an hour before admission to the hospital the child's right leg became entangled between the spokes of a wagon, and is said to have made one revolution of the wheel. Upon examination the leg was semiflexed, rotated, and displaced outward upon the thigh. Upon the inner and lower aspect of the thigh the diaphysis of the femur had penetrated the vastus internus muscle and could be felt beneath the skin, which was contused and very much thinned but not completely ruptured. The picture was that of an outward dislocation of the knee-joint. The condyles could be palpated in their normal relation to the tibia, however, and motion in the knee-joint was much freer than occurs in dislocation. The diagnosis of epiphyseal separation was confirmed by X-ray, and an attempt at reduction under anæsthesia was made. The diaphysis could not be dislodged from its penetration into the vastus internus muscle, so an incision was made over the diaphyseal fragment and the wound in the muscle enlarged. The periosteum, which had been stripped up the shaft for several inches with the diaphyseal end of the femur buttonholed through it, retained its attachment to the epiphysis. Owing to difficulty in reducing the fragments, a second incision was made upon the outer aspect of the thigh, splitting through the periosteal sleeve. Periosteal elevators were introduced through these incisions between the fragments, which were slid into posi-

FIG. 1.

Photograph of outward displacement of epiphysis.

U of M

FIG. 2.

Outward displacement of epiphysis with inward displacement of the diaphysis.

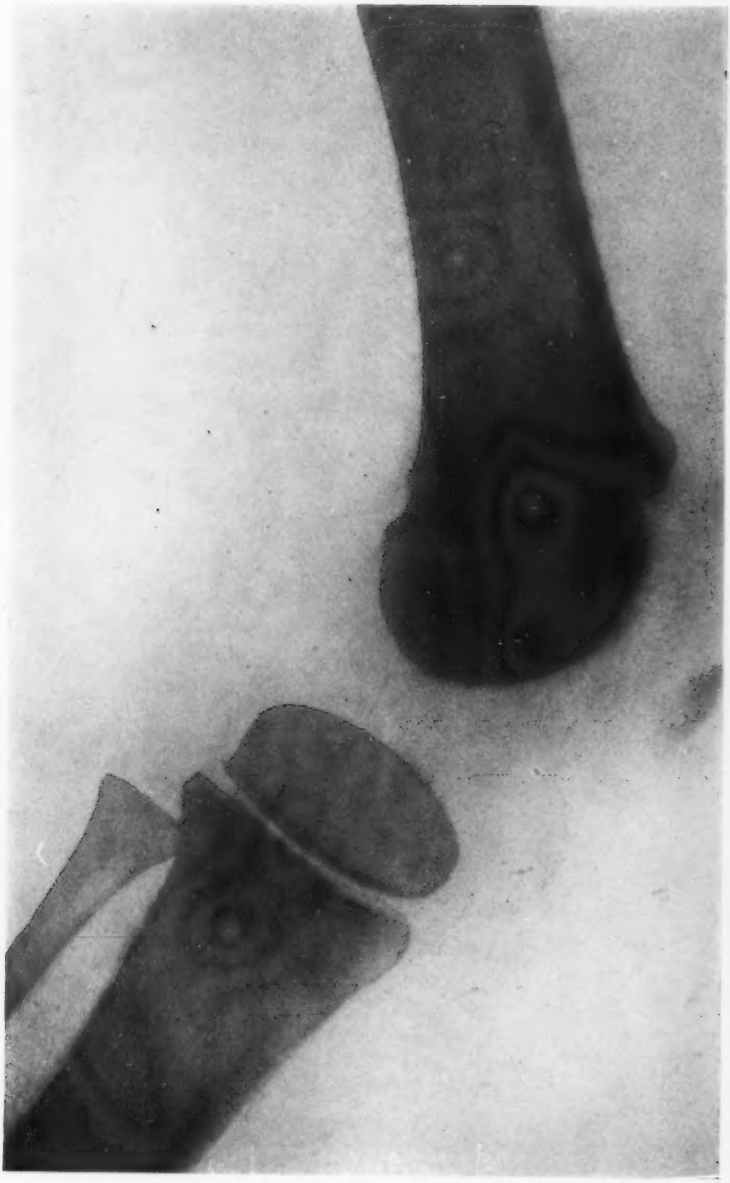
FIG. 3.

Anteroposterior and lateral view of Fig. 2, one month after operation. Shows fracture of tibia.

FIG. 4.

Anteroposterior views of right and left knees ten months after operation. Right was affected.

FIG. 5.



Lateral view of Fig. 2, ten months after operation.

tion while traction was being exerted upon the leg. Associated with the epiphyseal separation was an oblique fracture through the inner tuberosity of the tibia with very slight, if any, displacement.

The recovery was uneventful. He was allowed to walk eight weeks after the injury, the case having been removed ten days before, during which time he was given massage and passive motion of the knee-joint. There is now a normal range of motion at the knee-joint with no shortening of either the thigh or leg. The extremity is normal except for a slight genu valgum (see Figs. 1–5).

The causes of this separation may be grouped under predisposing and either direct or indirect violence. It is generally conceded by writers upon the subject that syphilis, tuberculosis, rickets, etc., predispose to epiphyseal separations. While there are many caused by a direct blow upon the knee and lower thigh, by far the greatest number of separations are due to indirect violence through the leverage of the leg or thigh, one of the other being fixed, the femoral epiphysis being firmly attached to the tibia and fibula by dense ligamentous structures separates under forced hyper-extension, -flexion, -abduction, or -adduction combined with traction and twisting. Hilgenreiner reports: 47 cases caused by entanglement of the leg in the wheels of wagons; 25 cases by hyperextension and flexion; 24 by direct injury; 8 from orthopædic operations upon the lower extremity (for contracture at knee, ankylosis of knee, congenital dislocation of hip, etc.).

In four of the eight cases which I have been able to find, the injury was caused by entanglement of the leg in the spokes of a wheel, three by hyperextension, in the other the nature of the injury was not stated.

In this separation the conjugal cartilage generally remains adherent to the epiphysis, and though a thin layer may adhere to the diaphysis it is more usual for flakes or fragments of the shaft to be dragged off by the epiphysis. If fracture of the diaphysis is associated with it, the fracture is usually situated on the side opposite to that on which the force begins

to act. It is probable that the separation and the displacement depend largely on the way in which the force is applied, and upon the continuation or discontinuation of that force. Thus it would seem that there is a partial separation of either the inner or outer condyle, and with the continuation or discontinuation of the acting force any one of the special separation and displacements attended with that complication may result.

The separation may be complete or incomplete; complete with fracture into the joint through the intercondyloid notch, incomplete with fracture into the joint through the intercondyloid notch; complete with fracture of the diaphysis or incomplete with fracture of the diaphysis. Of the varied positions that the fragments may assume, displacement of the epiphysis forward with the diaphysis backward into the popliteal space is by far the most frequent. The exact opposite displacement, the epiphysis displaced posteriorly with the diaphysis anteriorly, is the next most frequent. The epiphysis may be displaced to the inner or outer side, the diaphysis being displaced to the opposite side.

Owing to the great violence required to produce the separation of the lower epiphysis of the femur and the close proximity of important structures, associated injuries of the vessels, the nerves, and the joint, while not infrequent, have occurred in a surprisingly few of the reported cases. The separation is usually compound. The periosteum retaining its attachment to the epiphysis is stripped for a varying distance from the shaft by which it has been penetrated in the compound and in those simple cases in which open operation has been performed.

During the past decade, thanks to better wound handling and more accurate diagnosis, the mortality has been greatly reduced, the functional results have been better, and amputation, which was done in 63 of 208 cases, has been done but infrequently. With accurate reduction of the fragments in uncomplicated cases, union usually takes place with good function at the knee-joint, the ultimate result depending upon the reduction and the associated injuries to the neighboring

structures. Arrest of growth of bone as a rule does not occur. It is, however, to be feared, as premature ossification or permanent interference with the epiphyseal conjugal cartilage does sometimes occur, causing arrest of growth in both simple and complicated cases. Ollier estimates the growth from the lower epiphysis to be twice that from the upper.

These injuries differ widely in their symptoms, varying with the variety of displacement and with the associated injuries. The compound cases, with the protruding mammillated diaphysis denuded of its periosteum, permitting of inspection and exploration, offer no difficulty; on the other hand in many of the simple ones the diagnosis may be difficult. The age of the patient, the character of the trauma, and the deformity aid greatly in determining the nature of the injury. The condition is most likely to be confounded with supracondyloid fracture or dislocation at the knee-joint. In supracondyloid fractures, which are rather rare in children, the lower fragment is usually displaced backward, the line of fracture is at a higher level and usually more oblique. In dislocation at the knee-joint the condyles lose their normal relation to the upper service of the tibia which is maintained in epiphyseal separation. The motions at the knee-joint are less than in epiphyseal separation, in which the movements are quite free except for pain. The usual signs of fractures of the long bones are present; crepitus is not to be depended upon; if present is of the cartilaginous variety; X-ray confirms the diagnosis, the variety of the displacement, and associated fractures if present.

Many of the simple separations can be easily reduced under an anæsthetic by flexion with traction and manipulation, and the fragments maintained in position by either acute flexion, semiflexion, flexion at a right angle, or extension. When difficulty is experienced in reduction, Packard, Mayo-Robson, and others have advised division of the heads of the gastrocnemii, others have advised tenotomy of the tendo achillis. In the simple separations which cannot be reduced,

due to the intraposition of the soft parts, and in many of the compound and complicated separations, open reduction with accurate adjustment of the fragments should be resorted to, retaining the fragments in position by mechanical appliances if necessary. Resection of the diaphysis and excision of the epiphysis, operations which have been done for the condition, should be avoided. Not infrequently the injury is of such severity that the epiphyseal separation is of but minor importance. In such condition the treatment will have to be decided upon the merits of the case. Injuries to blood-vessels and nerves should be treated in accordance with the surgery of those structures.

Through the kindness of Dr. Robert Abbe, Dr. Charles Peck, and Dr. William Darrach, I am permitted to report the two following cases hitherto unreported.

Frederick S., age nine years, admitted to Dr. Abbe's service in Roosevelt Hospital, August 27, 1898, discharged March 8, 1899. Eleven days before admission to the hospital, the leg became entangled in the spokes of a wheel, causing an injury for which he was treated at home. Upon entrance to the hospital, examination revealed an infected wound upon the lower posterior surface of the thigh, from which protruded the diaphysis of the femur with the epiphysis displaced forward. The fragments were reduced, with drainage of the wound. The suppuration extended into the knee-joint, which was drained one week after the first operation. The patient recovered.

Clifford S., age eight years, admitted to Dr. Peck's service, operated upon by Dr. Darrach in Roosevelt Hospital in June, 1909, discharged July 30, 1909. Shortly before admission to the hospital the child was knocked down and run over by a wagon. Examination revealed a large gaping wound of the lower and outer surface of the thigh, through which the diaphysis of the femur protruded; the epiphysis was displaced forward and inward, the external popliteal nerve was ruptured, and the popliteal vessels badly contused. There were multiple fractures of the tibia and fibula. At operation upon the day of admission the nerve was sutured, the fragments reduced, with drainage of

the wound. Gangrene of the leg from thrombosis of the popliteal vessels necessitated amputation through the thigh four days later. Recovery.

BERTRAM (*Münchener medizinische Wochenschrift*, No. 12, March, 1911) reports three cases in children between the years of twelve and fifteen. In all of these the displacement of the epiphysis was forward, with the diaphysis displaced posteriorly into the popliteal space. Two of the cases he was able to reduce without open operation, the third requiring it, in which he obtained a good functional result.

DREW (Royal Society of Medicine of London, Orthopædic Section, January 29, 1910) reports boy eight and a half years old, knocked down by wagon. The epiphysis was displaced forward with the diaphysis displaced posteriorly into the popliteal space. He did an open operation, securing the fragments by means of a Lane plate. Good functional result.

PILLET (*Société de Chirurgie de Paris*, vol. xxxvii, No. 1, June 10, 1911) reports child, age six years, with trophic changes of the lower extremity from pressure upon the nerves. He resected the diaphysis three months later, with a good functional result.

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OBSERVATIONS ON FRACTURE OF THE ODONTOID PROCESS OF THE AXIS WITH INTERMITTENT PRESSURE PARALYSIS.

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AND

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OF ST. LOUIS, MO.

A CAREFUL study of the literature relative to injuries of the upper two cervical vertebræ convinced us that there is still much lack of knowledge here. Heretofore it has been difficult to make an accurate diagnosis. Until recently, the radiographic findings have been so poor that they were of little value in giving material aid. The papers of Mixter and Osgood (*Am. Journal of Orthopædic Surgery,* February, 1910) did much to clear up the subject, and their X-ray work was very good.

In the present communication we are able to show the value of radiograms and to compare them with the actual specimen. A study of the specimen shows clearly, also, how the patient was able to live so many years, and why he suffered from pressure paralysis from time to time. The history, in brief, is as follows:

M., aged fifty years, Russian; carpenter by occupation. At the age of eighteen years he fell from a scaffold, landing on the back of his head. He was confined to bed for half a year; was unable to move his head from side to side until after the lapse of one year. He then felt well, and served in the army for five years. He remained well until 1896, when he again fell from a ladder, striking upon his left shoulder. He continued to work until four or five months later; then, while at work, he suddenly felt weakness in both hands and right leg; loss of sensation in both hands. He was admitted to the Montefiore Home, New York. Under rest he soon recovered and resumed work. In 1901, for the third time

he slipped from a ladder, dropping a very short distance and landing on both feet. He stood motionless, could not sit or walk, and felt a sense of heaviness in both feet. He was taken to Gouverneur Hospital, and after a few days was able to walk. He had incontinence of urine and a constricting sensation about the abdomen. After two months again resumed work.

Present illness began in 1908. This time he did not fall from a ladder, but slipped on the ice, falling upon his right hip. He could not sit up or move his right arm and leg following the accident. He was again admitted to the Montefiore Home, September 13, 1909, and here he was under our observation. At this time, his chief complaints were: Inability to walk, incontinence of urine and feces, constricting sensation about chest, paræsthesia in legs, weakness of both arms.

Status.—All organs apparently normal. Thorax: Expansion limited, respiration labored, accessory muscles used. Cranial nerves: All normal. Reflexes: Triceps and wrist-reflexes exaggerated on right side. Knee-jerks exaggerated, right more than left; inexhaustible bilateral clonus. Oppenheim, Babinski, Gordon, and Becterew present.

Musculature: Atrophy of muscles of right arm and hand, and of rotators of shoulder. There is a marked depression just beneath the occiput, especially marked on the left side. The spinous process of the second cervical vertebra is very prominent. In the posterior pharyngeal wall there is a distinct depression.

Several radiograms were taken by Dr. Charles Gottlieb, one of which is reproduced here (Fig. 1). We also reproduce two normal radiograms for purpose of comparison (Figs. 2 and 3).

The very marked displacement of the atlas, bringing into relief the great spinous process of the axis, in the radiogram of our patient, is readily contrasted with the normal.

The X-ray findings, together with the marked paralytic symptoms, made it quite positive that our patient was suffering from the result of a fracture of the odontoid process. The presence of the paralytic symptoms warranted this diagnosis, since we know that in dislocations alone pressure symptoms are not, as a rule, present. Corner (ANNALS OF SURGERY, January, 1907), in "Rotary Dislocation of the Atlas," has called attention to the absence of paralytic symptoms in dislocation, reporting numerous cases.

The head was slightly extended and carried backward and a Calot jacket applied. This was followed by marked improvement. In a few days the patient was able to bear weight upon his legs and move about with the help of a cane. He was doing very well at this time, but chafed under the Calot jacket and begged for more freedom for his head. After some weeks the plaster was removed and a plaster jacket with jurymast was applied. Under the use of this for some months he lost some ground. By the latter part of April, 1910, many of his old symptoms returned, and he walked with difficulty. The following is taken from notes made by Dr. Sachs at this time:

"Symptoms have become aggravated; patient is unable to walk as well; right arm weaker; movements of right chest distinctly less than left (phrenic involvement); tactile sensation markedly diminished; delayed pain and temperature sensation."

On May 28, 1910, an orderly, while putting the patient to bed, bent the head so that the neck was put on stretch. Immediately thereupon all the extremities became paralyzed. The patient now remained bed-ridden and the paralytic symptoms changed slightly.

In June, Dr. I. Abrahamson examined him carefully, and the following notes are abstracted from the record of his examination:

"Breathing is labored; extension of left side of thorax greater than right; myopathic irritability of both pectorals markedly exaggerated, fascicular in type. Reflexes; upper abdominal very lively; lower present; both knee-jerks lively. Inexhaustible clonus on both sides. Motor paralysis not complete, but all movements weakly executed; deep sensibility apparently intact."

Early in July patient developed bed-sores. Both paralysis of motion and sensation below site of lesion became almost complete. Respiration was entirely abdominal and very labored. Patient died July 23, 1910.

Autopsy.—The upper portion of the cervical column was removed, together with the spinal cord. With the aid of several photographs and drawings, we will attempt to show what was found, and how the intermittent pressure paralysis is to be explained.

A transverse section of the specimen is shown, photographed, in Fig. 4; drawing of same, Fig. 5.

These show the odontoid process of the axis not in its normal position on a plane with the posterior line of the body of the

FIG. 1.

Radiogram of patient. Atlas forward; spinous process of axis prominent, and space between latter and occiput greatly increased. Shows also upper cervical spine minus atlas, pushed backward.

FIG. 2.

Radiogram of a normal upper cervical spine. Note relationship of atlas and axis. Compare with radiogram of patient, Fig. 1.

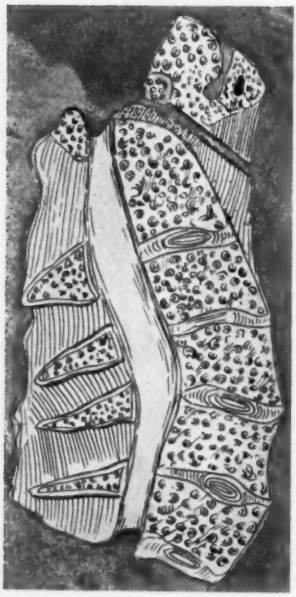
FIG 3.

Radiogram of normal upper cervical spine of young adult.

FIG. 4.

Photograph of specimen and upper cervical vertebræ sawn through. Shows the false joint and displaced odontoid process. Shows also upper cervical spine bent backward.

FIG. 5.



Drawing of specimen showing ankylosis of odontoid process with arch of atlas anteriorly. Shows also posterior arch of atlas impinging on spinal canal.

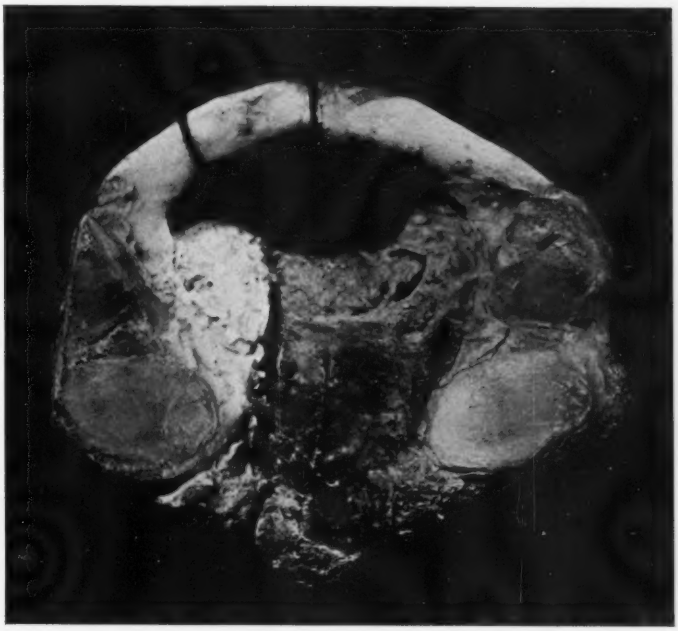
FIG. 6.

Photograph of normal cervical spinal column. Note articulating processes between atlas and axis and between axis and third cervical vertebra.

FIG. 7.

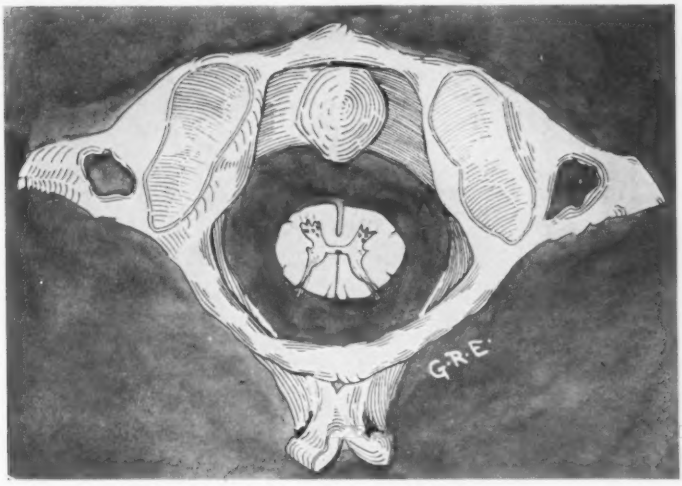
Photograph of cervical spine showing atlas carried forward on axis as in our patient. Here the articulating processes referred to in Fig. 6 are well shown. One offers no resistance to forward displacement.

FIG. 8.



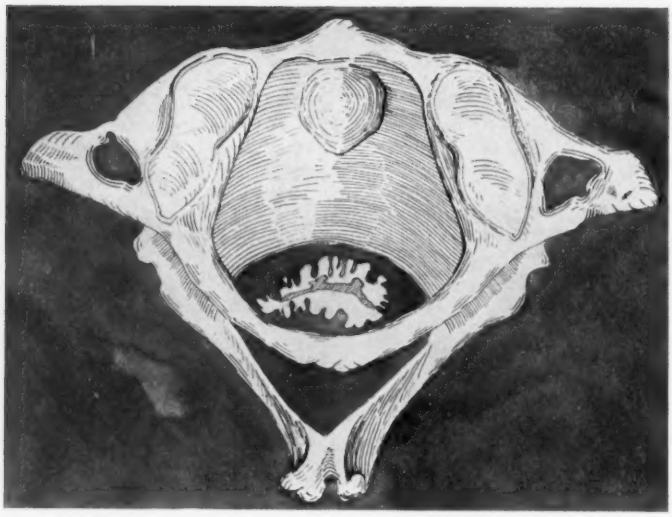
Photograph of specimen looking directly down upon the atlas and exposed part of axis. Odontoid process is lying between the articulating processes in deep shadow. Note narrowed medullary canal.

FIG. 9.



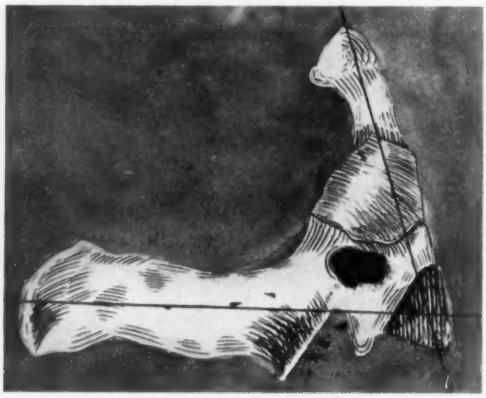
Shows normal position of atlas and axis. Note relatively large space for spinal cord.

FIG. 10.



Drawing showing atlas carried forward on axis, having taken odontoid process with it. Shows the false joint formed largely by the upper portion of axis. Shows also spinal cord compressed, and how the compression occurs.

FIG. 11.



Shows normal position of odontoid process at an acute angle; is braced for blows from behind and above. Note especially the articulating processes: that between atlas and axis offers no backward resistance.

vertebra, but carried well forward and resting upon the antero-superior surface of the body of the vertebra. The fracture of the odontoid did not occur at its neck, but below, directly through the extreme upper part of the body of the vertebra.

FINDINGS AND OBSERVATIONS BASED UPON A STUDY OF THE SPECIMENS.

1. *Position of Atlas and Odontoid Process.*—The atlas is carried forward on the axis almost evenly, and not especially rotated, as Corner has found and believes is the rule even when the odontoid process is fractured. Here the atlas has gone forward quite evenly, with a slight tendency to the left (Figs. 6 and 7).

2. *The Fractured Surface by Attrition Converted into a False Joint.*—The odontoid process and portion of the neck of the atlas have a large articulating surface. This articulating surface is artificial—a pseudo-arthrosis, and several times larger than the normal. The normal articular facets have been obliterated and merged into the acquired false joint. The axis, minus its odontoid process, has been pushed backward, and worn down anteriorly by attrition, thus greatly increasing the articulating surface and explaining its increased size.

3. *Compensatory Curve in the Cervical Vertebræ Below the Site of Fracture.*—The second, third, and fourth cervical vertebræ have been pushed backward, owing to the atlas having gone forward. This must occur to a greater or lesser degree in all dislocations or fractures involving the two upper cervical vertebræ (see Figs. 4 and 5).

4. *The Constricted Space for Spinal Cord Owing to the Forward Displacement of the Atlas.*—This is seen by looking directly down upon the upper portion of the vertebral column (see Fig. 8).

The odontoid process having been broken off and carried forward with the arch of the atlas, narrowed the spinal cord space and, in our patient, explains the spinal cord compression. Through the arch of the atlas going forward, the cord was dragged against the posterior border of the fractured body of

the axis—a sharp angular edge. In time this became somewhat rounded. The manner of this compression is shown by means of drawings (Figs. 9 and 10).

Normally, at this level, the spinal cord has a great deal of room. Extensive dislocations take place with no sign of cord compression. From the drawings it will be readily understood how the atlas moving forward on the axis presses upon the cord, very much as a tonsillotome severs a tonsil. Practically all of the cases of verified fracture of the odontoid process have had pressure paralysis, and in the end have been fatal. The case now under consideration was fatal, but only after 32 years—a long earthly existence with a broken neck!

5. *Ankylosis of Odontoid Process with Arch of Atlas.*—At the point of pressure contact between the arch of the atlas and odontoid process ankylosis has occurred. Careful examination shows this ankylosis to be bony. The odontoid process corresponds to the body of the atlas and embryologically belongs there, but through certain evolutionary stages has become detached and normally is found joined with the axis. So in our specimen we note a *Deus ex machina* atavistic trait—a sudden return of this process to its early embryological home. It has now really become a part of the atlas—its body proper.

6. *Insecurity of This Portion of the Vertebral Column.*—Let us take a normal spinal column and note the weak points in its structure at its upper level. The odontoid process is narrowed at its neck, the point of contact with the great transverse ligament. The cheek ligaments offer a great deal of resistance, it is true, but these are frequently readily broken. In our specimen no vestige of these ligaments remains.

Reference to Fig. 11 will show how little articular resistance is offered to the atlas sliding upon the axis. The articulation here has a good deal of motion owing to the great laxity of its capsular ligaments permitting motion.

Note the entirely different articulation between the second and third cevical vertebræ and below these. Veritable buffers stand up, resisting an enormous amount of force (Figs. 6 and 7).

Owing to the laxity of ligamentous connection between atlas and axis, a sudden blow upon the back of the head with neck muscles lax, getting the so-called "flying start" of Corner, spends its chief force on this odontoid process of the axis. A study of the axis will further teach us that through natural selection the odontoid process has acquired a backward bracing position. It is set at an acute angle, instead of a right angle (see Fig. 11). It is thus braced for the deadly forward blow which so often tends to fracture.

We are not surprised to see reported, now and then, serious accidents from carelessly manipulating this part of the vertebral column. The osteopaths have some cases of serious injury credited to careless manipulation, and some have been reported. Corner, in his article, mentions one.

7. *The Intermittent Pressure Paralysis.*—A study of the specimens and drawings shows us how the spinal cord segment was constantly balanced at the border line of safety. The different traumas caused the cord, from time to time, to become nipped, with the resultant paralysis, varying according to the extent of the injury. At last, however, the cord was seriously damaged, the respiratory centre became implicated, and death resulted.

REMARKS BY DR. ERNEST SACHS.

When I first saw this patient in 1909 the diagnosis of recurrent dislocation of the atlas with fracture of the odontoid process was readily made, and, as Dr. Elliott has already mentioned, was confirmed by the X-ray. Was this, then, a case for the Mixter-Osgood operation? As the patient's respiratory apparatus was somewhat impaired upon admission, it seemed to us that conservative orthopædic appliances should first be tried. Furthermore, as the case differed in two other respects from those reported by Mixter and Osgood, I considered operation unwise. The patient had, in the course of thirty years, a number of attacks of paresis, and the prolonged presence of increased reflexes, together with atrophy of the muscles of the arms, indicated that secondary changes in the cord were present.

When the patient suddenly became worse, on May 28th,

immediate operation was considered, but, in view of marked respiratory paresis, the danger from an anæsthetic, together with the secondary degenerative changes that already existed, forbade surgical interference.

The anatomical examination of the spinal cord showed that the crossed pyramidal tracts were completely degenerated and atrophic. The pseudo-arthrosis that had formed at the site of the fracture precluded any favorable result from the Mixter operation, as a recurrence would certainly have followed.

As Dr. Sachs has clearly pointed out, this case was not a favorable one for the Mixter-Osgood operation. In the recent specimen, to drag the atlas back one-sixteenth of an inch required considerable force; to have held it there would have been more than could be expected from ligatures. If any operation is to be considered in cases similar to the one under consideration, we suggest a laminectomy—a removal of a portion of the posterior arch of the atlas. Such an operation would be permissible whenever the Mixter-Osgood operation could be performed. In these days of successful spinal surgery such an operation, in properly selected cases, is entirely feasible.

MEDIOTARSAL SUBLUXATION AS SHOWN BY THE X-RAY.

BY EUGENE R. CORSON, M.D.,

OF SAVANNAH, GA.

THE mediotarsal joint, formed by the articulations of the os calcis with the cuboid and the astragalus with the scaphoid, is about the middle of the arch of the foot and more directly transverse than any of the other tarsal articulations. Moreover, the gliding movements between the opposing bones are greater than in the other tarsal joints, permitting some rotation inward and outward with inversion and eversion of the foot, combined with extension and flexion. For these reasons it is the weaker of the tarsal joints and must play a prominent rôle in all deviations of the foot from the normal, congenital or acquired, and in all accidents of sprains or contusions. The most unstable tarsal bone is the astragalus, and the most liable to dislocations and fractures. It sits the os calcis much like a woman sits a horse on a side-saddle, with the sustentaculum tali corresponding with the horn of the saddle. Of dislocations of the astragalus we may see almost any form, even to rolling it out into the road, as described by Hammersley. Slight as the movements may be between the individual bones, the combined movements of all the bones are considerable. So long as there is no disarrangement of opposing surfaces, these bones may stand considerable strain and pressure, without pain, but let there be the slightest displacement in these opposing surfaces and at once we have pain, and even great pain, from the slightest movement or pressure.

In the ordinary sprains which come to us there is usually some slight slipping of opposing surfaces, to quickly readjust themselves or to remain more or less permanent. Be the distortion or malformation what it may, so long as the opposing surfaces are congenital and used to each other, there is usually

no pain from pressure or movement, even where the foot is subjected to the most perverted functioning and we have a callus almost on the dorsum of the foot.

It is not the loss of the arch *per se* which makes the flat foot so painful, but the disarrangement of the opposing articular surfaces. Where flat foot is the normal condition there is no pain.

So the ideal treatment of sprains is to quickly reduce any disarrangement of opposing articular surfaces and the reactionary inflammation and swelling of the softer tissues. There could be no worse treatment for a sprained or swollen ankle than the old plaster-of-Paris bandage, which tended to hold and set whatever displacement might exist. With the new method of water dressings, massage, adhesive strappings, and *early use of the foot,* any disarrangement of the tarsal bones is usually quickly overcome, and the foot returns promptly to its normal condition.

The following case of subluxation at the mediotarsal joint with rotation of the astragalus and calcis inwards is a good example of a quick return to normal after a prompt reduction.

A little girl of nine years was run over by a light delivery wagon, the wheel passing over the left foot on the outer side just proximal of the mediotarsal joint. The child complained bitterly of the pain and refused to touch her foot to the ground. When seen by me, the foot was in pronounced extension and inversion. I at once made an X-ray, which showed a subluxation at the mediotarsal joint. The child was anæsthetized, and the foot and ankle manipulated by a rocking and to and fro movement, when a return to normal was at once evident by a disappearance of the extension and the immobility of the foot. The foot was massaged and a plain roller bandage applied; and the child ordered to use the foot as soon as possible. The acute pain at once disappeared and the soreness soon after. A second X-ray showed the bones in their normal position. A comparison of the two X-rays is very striking and instructive. To one who takes many radiographs of the foot the deformity is at once apparent by the overriding of the shadows of the astragalus and calcis and the

FIG. 1.

Medio-tarsal subluxation with extension of the foot and rotation inwards.

FIG. 2.

The same after reposition.

occlusion of the ever-prominent direct interval between the two bones, well shown in the second radiograph after the correction of the deformity. The increased interval between the calcis and the cuboid and the astragalus and the scaphoid is very evident, as well as the rotation of the foot inward, apparently widening and increasing the arch of the foot. It is understood, of course, that the two radiographs are taken under as similar conditions as possible. I have not seen any radiographs before showing this deformity, nor have I had a similar case in my practice, which has induced me to publish this case.

MULTIPLE GUNSHOT WOUNDS OF INTESTINE WITHOUT PERFORATION OF LUMEN.

BY ROBERT M. THORNBURGH, M.D.,

OF SAN FRANCISCO, CAL.,

Major, Medical Corps, U. S. Army, Chief of Surgical Service, Letterman General Hospital.

On March 29, 1912, Private W. U., Thirtieth Infantry, white, age twenty-five, was brought into the Letterman General Hospital, suffering from a self-inflicted gunshot wound of the abdomen, incurred less than an hour prior to admission. Upon removal of emergency dressing the condition shown in Fig. 1 appeared.

Wound of entrance: 3 cm. x 2 cm. diameters, 5 cm. to left and 2 cm. above umbilicus, a knuckle of ileum protruding. Wound of exit: 1 cm. diameter, directly above left posterior superior spine of ilium at level of umbilicus.

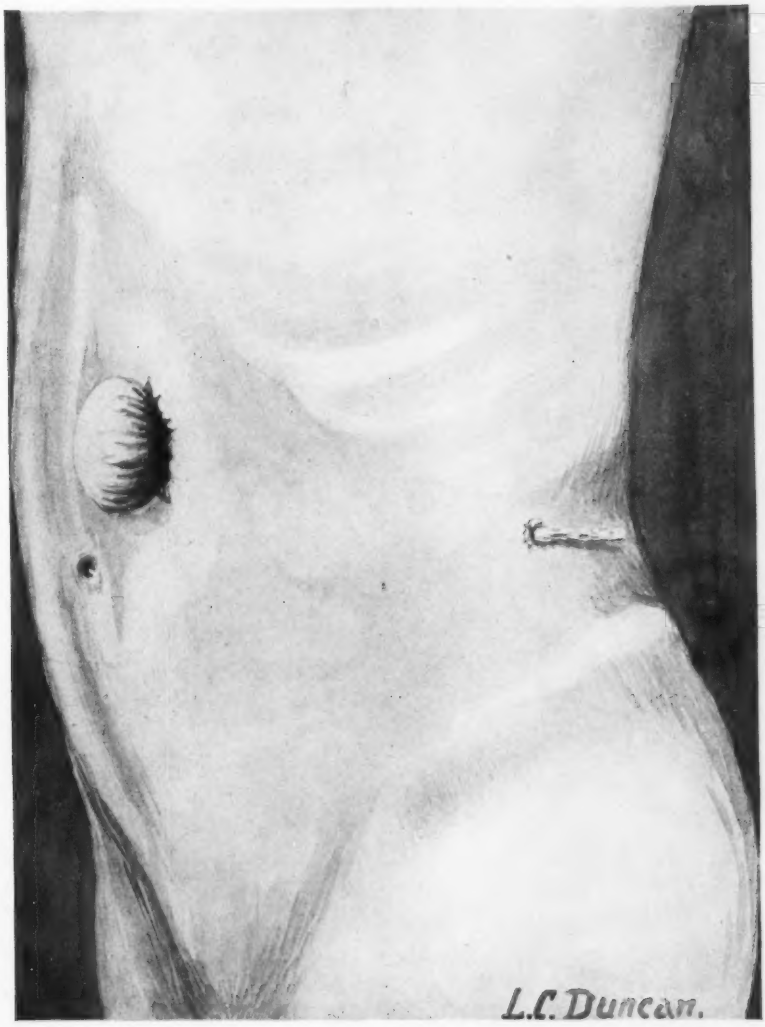
Weapon: .30 calibre U. S. Army regulation Springfield rifle, service cartridge, full powder charge. Velocity at muzzle: about 3000 feet per second. Muzzle of rifle was pressed against abdomen and trigger pulled. Incurred in barracks, Presidio of San Francisco.

On admission it was found that the bullet had penetrated a woollen shirt and cotton undershirt before entering the abdomen. Condition as described above.

A laparotomy, T-shaped incision, was done at once. The belly was full of blood and first effort was directed to finding and tying the injured vessels. At the same time an intravenous saline infusion was administered by an assistant. Twelve large mesenteric vessels were found bleeding profusely; when they were ligated the hemorrhage was controlled.

The abdominal viscera were next explored and injuries were found as follows: 35 cm. of ileum was completely denuded of its peritoneal and most of its muscular coat. Its mesentery was destroyed (Fig. 2). There were three wounds in the descending colon and very numerous wounds of the mesentery. *No*

FIG. 1.

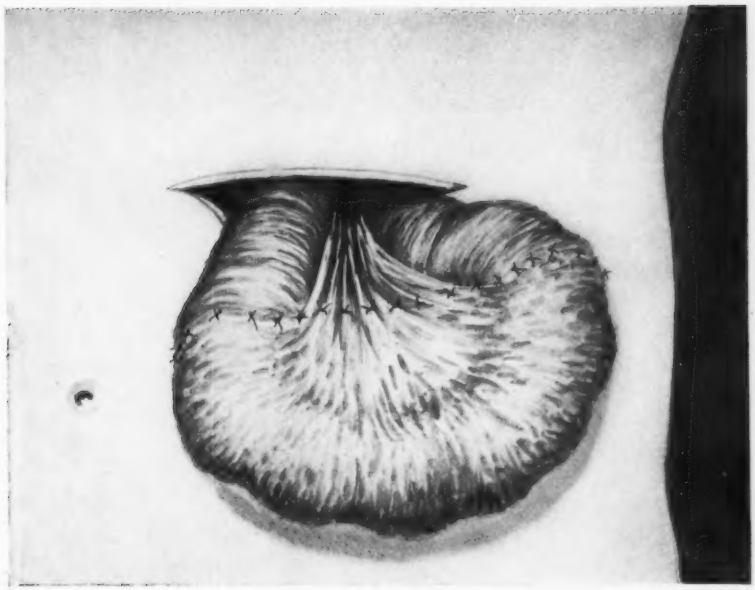


Condition on removal of emergency dressing. Knuckle of gut protruding from wound of entrance—omentum from wound of exit.

FIG. 2.

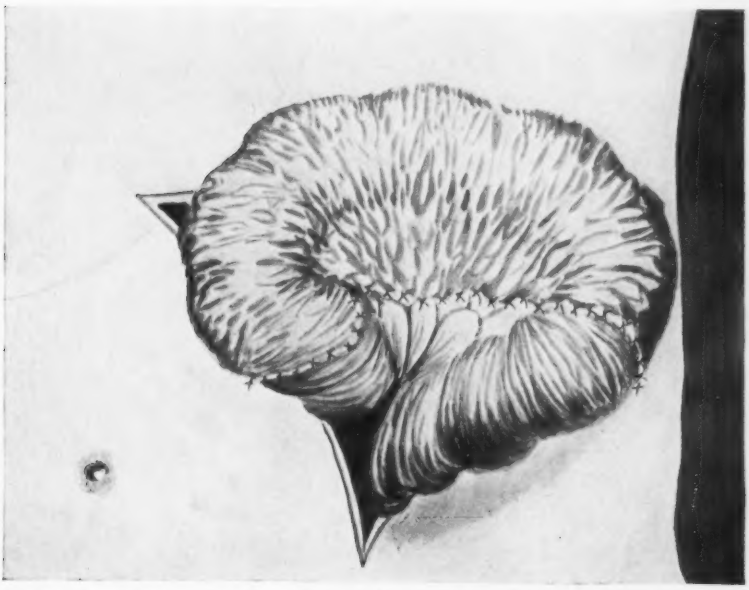
Shows denuded ileum and destruction of mesentery.

FIG. 3.



Omentum brought down from above, sutured to superior surface of mesentery and ileum.

FIG. 4.



Omentum carried over from superior surface and sutured to inferior surface of mesentery and ileum, forming pocket which completely covers injured viscera.

perforation of the intestinal lumen could be demonstrated. No further wounds of viscera could be found. The wounds of the colon were inverted with purse strings or Lembert's, and attention was then directed to the wounded ileum. The patient was in such a condition of profound shock that resection of gut and mesentery was out of the question. The excellent proceeding, splitting the mesentery, described by Richardson, in ANNALS OF SURGERY, for December, 1911, was also impossible, owing to the fact that the mesentery was destroyed.

The writer decided to try to substitute omentum for the outer two coats of the ileum as well as for both layers of mesentery. The omentum was brought down and sutured to the superior surface of mesentery and gut by interrupted sutures. It then was carried over to the inferior surface and attached in like manner (Figs. 3 and 4). A portion of the omentum was protruding from the wound of exit (Fig. 1). This was amputated.

The patient was drained in front and behind and placed in the Fowler position with the Murphy drip for the first 24 hours. The drip was discontinued after the first 24 hours and not resumed. The Fowler position was maintained for about two weeks.

The convalescence was perfectly normal. There was no infection of any kind and the patient has perfectly recovered.

The writer has been unable to make an extended search of the literature, but has not found any such procedure described in the literature available. Surgeons frequently covered denuded bowel, appendix stumps, etc., with omentum and mesentery, but supplying two bowel coats and the mesentery also in a wound of such magnitude, if previously described, has not been seen by the writer.

The writer desires to express his thanks to Captain L. C. Duncan, Medical Corps, Senior Surgical Assistant, for the excellent drawings accompanying this article.

DISPLACEMENTS OF THE COLON.*

BY CARL E. BLACK, M.D.,
OF JACKSONVILLE, ILL.

I WILL first relate a case and then proceed with its discussion. The diagrams accompanying the paper may not all be referred to in detail, but will serve to illustrate the main points to which attention is desired. While each one represents a condition actually found (and the authority is given), they are not selected because of great similarity to the case reported, or because of the great weight of authority of the reporter. In selecting cases I have attempted to illustrate the principal fundamental displacements and the method by which they occur. Other cases of far more striking and complicated abnormalities could have been secured. The case was as follows:

Personal History.—Male, aged fifty-two, widower with two grown daughters. Merchant in good circumstances and high social standing. No bad habits, active and energetic. In no sense an invalid, being able to attend to business regularly each day.

Previous Illnesses.—Ordinary diseases of childhood. Twenty-one years ago had a severe and prolonged illness from an acute abdominal inflammation with diagnosis of appendicitis. Was attended by Dr. T. J. Pitner, of Jacksonville, who furnished the history of the attack from his notes made at the time. The pain and tenderness were in the right lower abdomen and were accompanied by fever, prostration, and all the evidence of an extensive infection. The abdomen was greatly distended for many days, and during this time the patient spent much of his time on the right side with the knees drawn up. The bowels were obstinately constipated, and there was much nausea and vomiting, especially in the early part of the illness. Patient was confined

* Read before the Western Surgical Association at Kansas City, December 18, 1911.

to his bed for about two weeks, his ultimate recovery was quite satisfactory, and he went back to his duties in about the usual time. He did not again consult his physician until 1899, when he complained of "some gastric and intestinal pains," for which he had four prescriptions. He did not again seek advice until 1904, when he complained of "intestinal indigestion," accompanied by diarrhœa. During 1904, 1905, and 1906 he consulted his physician several times on account of this diarrhœa and abdominal distress. The gastric or intestinal distress was attributed to indigestion, and for a long time thought to be due to errors of diet. He was active in business, well nourished, and could in no way be classed an invalid. He had the annoyance of a diarrhœa and sometimes pain. During these years the diarrhœa and abdominal pain were accompanied by more or less tenderness in the right iliac region.

In May, 1907, this patient was referred to me by Dr. Pitner, with the above history of intermittent attacks of diarrhœa accompanied by more or less pain in the right lower abdomen. Sometimes the pain was on the left side, and it was always accompanied by tenderness in the right iliac fossa. Some of his symptoms suggested a colitis. On rising in the morning he would immediately have a small stool; after dressing he would have a second small stool; after eating his breakfast a third, and after arriving at his place of business, a fourth, etc. It was imperative that he answer these demands at once, and after four to six evacuations in the morning, he would be comfortable the rest of the day and only occasionally would he be troubled at other times. He was becoming decidedly neurasthenic. At this time physical examination showed marked localized tenderness and thickening on the right side, and after consultation he was advised to have the appendix removed. Nothing was done at this time, and in fact I did not see him professionally again until he was referred to me by Dr. Edward Bowe, June, 1910. In the meantime he had consulted three or four physicians of national reputation in Chicago, St. Louis, and New York. From all he got the same advice, namely, "have the appendix out." He presented himself again July 9, 1910, and reported that, as he still had the pain on the right side and as the diarrhœa was increasingly annoying, he had decided to have the operation for appendicitis.

Operation.—After the usual preparation the abdomen was opened at the external border of the right rectus. Adhesions were encountered, involving the anterior abdominal peritoneum from the point of incision to the wing of the pelvis and on around to the posterior abdominal wall, and they extended as high as the lower right hypochondriac region and into the pelvis below. The viscus surrounded by adhesions was plainly large gut, but the adhesions were so extensive and dense that it was impossible to distinguish the exact portion of the colon involved, but it seemed fair to assume from its location and direction that it was the ascending colon and cæcum and that the cæcum was adherent in the pelvis. After breaking up a considerable number of the adhesions I felt sure that I could outline the lower end of the cæcum over the brim of the pelvis, and this conclusion was emphasized by finding a loop of the ileum entering the mass of adhesions in this direction. That portion of the large gut from about the level of the anterior superior spine of the ileum to the brim of the pelvis was narrowed to one-fourth its normal capacity, and after passing the brim of the pelvis widened out again to what seemed to be the normal capacity of the cæcum, although it was bound down in the pelvis by some adhesions. The narrowing of the gut above seemed to account for the symptoms and consequently no effort was made to seek out the appendix, which was considered to be down in the pelvis among the adhesions. After breaking up sufficient adhesions to release the narrowed and bound down colon it seemed to have sufficient capacity and the circulation seemed ample. The abdomen was closed and the patient returned to bed in good condition.

After 48 hours the patient developed acute obstruction, and the abdomen was reopened. The first thing which attracted attention was that the colon below the seat of constriction was distended. This was a very confusing circumstance, as according to our previous findings the lower portion of the bowels would be collapsed. This was evidence that our previous findings were incorrect. In order to test the matter a rectal tube was introduced. It came up on the right side of the pelvis into what was erroneously thought to be cæcum, but now was demonstrated to be the sigmoid displaced to the extreme right and densely adherent in the right iliac fossa and to the anterior abdominal wall. By breaking up more adhesions it was evident

that the ileum did not find its entrance into the cæcum in the pelvis, but passed upward behind the constricted sigmoid to enter the cæcum just below the border of the ribs, and that it was considerably involved in the adhesions and that the lower end of the cæcum and the appendix were held down by broad and enveloping adhesions. Rarely are such extensive areas of adhesions found as existed in this case. The appendix was practically obliterated. After finally locating the cæcum the whole pathological picture became clear. In fact, it was now plain that all the colon except a small portion at the splenic flexure was on the right side of the vertebral column, and that the splenic flexure was far from its usual location. After liberating constricted portions of gut while the adhesions greatly constricted it, the calibre seemed sufficient and the circulation good, and the abdomen was again closed. This did not relieve the obstruction and the patient died in a few hours. When it was too late it was evident that an anastomosis with or without resection should have been made, but the unusual character of the case made it difficult to foresee that the liberated colon would not regain its function. The postmortem fully confirmed the above findings and showed no other lesion in either abdomen or pelvis.

This case is reported with the hope that it may furnish a basis for profitable discussion, and that it may serve to put us more on guard for the possibility of similar conditions. The literature of displacements and inflammatory conditions of the colon has been searched with some care for the record of similar cases, but I have not been fortunate enough to find such.

The case shows that more careful study of the position of the colon is necessary. "Abnormalities do not, of themselves, produce symptoms but lead to mistakes in diagnosis" (Von Bergmann), and operative procedure based on a failure to understand the possible displacements of the various portions of the colon may be disastrous. In the case reported the extensive results of the appendicitis obscured the contents of the right iliac fossa to such an extent that we were entirely misled. The first supposition on finding the gut narrowed and adherent was that we had an exaggerated cornucopia cæcum. Later finding the ileum apparently entering

a portion of large bowel of comparatively normal size led us to believe that the stricture was in the ascending colon, and that the cæcum was in the pelvis. Only subsequent events demonstrated the great error of this view.

It is necessary to consider a few facts concerning development of the colon in order to have a clear idea of some of the displacements. This case and many others illustrated by the diagrams show plainly that more than one factor enters into their production. By the end of the tenth week the intestinal tube which has been straight has developed its U-shaped loop and the end of the cæcal bud is beginning to form the appendix. All of the colon is still to the left of the median line, but by the end of the fourth month the cæcum which was at the umbilicus has migrated to the left hypochondrium and rotated across the duodenum and superior mesenteric artery to a position beneath the liver, where it remains until birth, when it descends soon after to the right iliac fossa.

The text-books make slight mention of the frequency and importance of the variations in the location of the colon, but a search of the current literature reveals reports of a considerable number of cases. Recently studies along this line have been active. It is difficult to find exact statements of the normal location of the various segments of the colon, and there is considerable conflict among authorities. The cæcum is not infrequently found over the brim of the pelvis, or, as in the case reported, high up in the lumbar region. The ascending colon may, on the other hand, be so long as to make secondary folds, and its mesentery may be (Curschmann) long enough to be twisted. The transverse colon may be short at either one or both flexures. In the latter case the ascending and descending colon are almost like the limbs of an inverted V. Probably much more often the transverse portion may be too long and descend in the middle like an M, with the middle point as far as the pelvis. There may be a double fold of the transverse colon. It has been said that congenital anomalies of the descending colon are practically never seen (W. Wayne Babcock and Boardman Reed). If this is true the marked displacements of the descending colon shown in many

of the diagrams must be considered as acquired—probably cases in which the descending colon was pulled over by the displaced sigmoid. The descending colon may present folds, but an elongated sigmoid flexure which is accompanied by increased length of the large intestine is more common. The flexure of the sigmoid may reach to the transverse colon or to the diaphragm. Sometimes the sigmoid has several folds.

From a study of a considerable number of reported cases it would seem that the splenic and hepatic flexures of the colon are the two most uniform portions, and it is comparatively rare for either to be seriously disturbed. The accompanying illustrations show the splenic and hepatic flexures almost uniformly in place.

There is quite as much variation in size and length of the gut tube and length of mesentery as there is in location. The length of the adult colon varies within the limits of normal function from 39 to 78 inches (Babcock). The length or character of the mesentery is probably the most important single factor in variations in the location. In 18 per cent. of cases the ascending and descending colon have a mesentery (Jounesco), but the cæcum is never anchored by a mesentery, but remains movable (Gainsburg). A long mesentery gives greater mobility and allows the loops to be displaced. In such cases inflammation may give rise to adhesions which easily retain them in the abnormal position.

The conflict of opinion pertains mainly to the sigmoid segment. One (Deaver) says: "It will be seen, first, to cross the psoas muscle and the external iliac vessels at a right angle, then to descend vertically to the floor of the pelvis, along its left. From this point it runs along the floor to near the right wall of the pelvis, turns upon itself and passes to the left of the median line, to terminate in the rectum." Another author (Piersol) says: "It begins at the crest of the ilium as a loop of varying length, which is attached by a mesentery, and ends at the middle of the third sacral vertebra. Its usual length is from 25 to 56 cm. (10 to 18 in.), but is occasionally much longer. As the sigmoid flexure descends along the sacrum it usually curves to the right and crosses the median line."

It is stated (Cunningham) that in 92 per cent, of cases the pelvic sigmoid is found in the true pelvis after death. Robinson after taking measurements in 200 cases says: "The first and most frequent 'position' is when the sigmoid flexure lies above the pelvis against the dorsal wall, chiefly in front of the lumbar vertebræ and to their left. Most other positions of the sigmoid are uncertain, temporary, and variable."

The difference of opinion of anatomists as to whether the sigmoid belongs normally in the pelvis or above it and whether it joins the rectum in a direction from the left or from the right would indicate that this loop of large intestine has a wide range of normal mobility and position, depending largely on the length of its mesentery. No author consulted considers that this mobility allows the sigmoid to occupy the position of the cæcum as in the case reported. Only when one segment of the colon permanently invades the territory belonging to another segment can it be said to be abnormally located, although its location may be unusual.

English anatomists divide the sigmoid into the iliac portion, five to six inches long, which extends to the brim of the pelvis, and the pelvic portion, 16 to 18 inches long (Mayo). The mesenteric attachment ends at about the third sacral vertebra and this marks the termination of the sigmoid. Its length is variously estimated from 10 to 27 inches.

"The diameter of the sigmoid is less than one-half that of the cæcum" (Mayo). The function of the sigmoid to act as a reservoir to contain fecal material is facilitated by the several curves.

The difference of opinion regarding the length and location of the sigmoid is probably explained by the fact that at birth it comprises nearly one-half of the entire length of the large intestine (Gainsburg). Piersol quotes Treves as saying that the length of the intestine, and especially the colon, is singularly constant at birth. He found the average length of the colon to be one foot and ten inches. This length is maintained for two months, owing to the fact that the large gut grows at the expense of the sigmoid. At four months they have assumed their permanent proportions. Piersol also

calls attention to the fact that owing to the relatively small size of the infant pelvis, the sigmoid loop lies on the right side of the abdomen.

It must be accepted as a fact that the colon normally has a wide range of variations in location, and further that few of the abnormal variations are due to a single cause, but are rather due to a combination of causes. A congenitally undescended cæcum leaves room for an elongated sigmoid loop to occupy the right iliac fossa. Later an acute inflammation fixes the sigmoid in its abnormal position and furnishes the distention which carries the descending colon up out of place, and later contractions shorten up the gut length. Such a combination of causes may explain the condition found in my case.

Attempts at classification of the displacements of the colon seem to be incomplete and unsatisfactory. Most authors seem to rest content with describing them under two heads, namely, the congenital and acquired. A true understanding of the mechanism of displacements requires further division of these main heads, and the addition of at least one other is important. For purposes of study the following classification is suggested:

I. Congenital: (*A*) Arrested development: (1) of gut tube; (2) of mesentery. (*B*) Overdevelopment: (1) of gut tube; (2) of mesentery. (*C*) Arrested rotation: (1) at the umbilicus; (2) splenic flexure; (3) hepatic flexure. (*D*) Non-descent of cæcum.

II. Acquired: (*A*) Ptosis—"a falling": (1) overdistention; (2) weakened ligaments. (*B*) Displacement by weight of other organs. (*C*) Displacement by tumors: (1) of gut; (2) of other organs. (*D*) Inflammatory displacements: (1) overdistention; (2) traction resulting from adhesions. (*E*) Displacement from obstruction and overdistention.

III. Combination of congenital and acquired causes.

Still other subdivisions may be made, as for example some one (Von Bergmann) has classified them as to location in the abdomen and proportionate length of the various segments.

In the divisions which are suggested it is taken for granted that all of the conditions may be either "complete" or "partial." There is no attempt to classify cases in which the colon is within its normal range of location and yet is "overdeveloped" or development is "arrested." Ptosis often has an element of chronic inflammation.

It is surprising how little comparatively has been contributed from the operating table regarding abnormalities in the location of the colon. This is shown by the fact that in only three of the cases illustrated and in very few of the reports examined was the abnormal position diagnosticated during life. In most of the cases where on operation diagnosis of displacement of the colon was made the operation was undertaken for acute obstruction. We are still too much guided by post-mortem findings in which there is no way to know whether the abnormal position was of long standing or accidental, or whether it was the product of the patient's final illness. It will require considerable work upon the part of surgeons to clear up the prevalent ideas of the position of the colon and especially the position of the sigmoid flexure; nor do we know as much as we should regarding those influences which lead to acquired abnormalities. Many of the cases reported as anomalies are really not such, but simply represent segments which are longer or shorter than usual, as illustrated in Fig. 5. Eastmond and others have demonstrated the value of the X-ray in showing the location of various parts of the colon.

True congenital anomalies are usually plain enough, but in most of these no harm or inconvenience comes to the patient until some acquired influence complicates the congenital abnormality. Comparatively scant emphasis has been placed on the complications which may arise from displacements of the various parts of the colon and especially displacements of the cæcum or of the sigmoid. It is upon this point that I wish to place especial emphasis, and to this end I have gathered a number of cases and have made diagrams of several to illustrate some of the most frequent types of displacements of the colon reported. Most of these illustrations unfortu-

nately are from post-mortem findings rather than from the operating table. My case illustrates how a similar complication might have arisen in any one of the several cases shown if the malposition had been complicated by peritonitis with adhesions. In one case, reported by Shober, the proper treatment is still unsolved. Evidently the patient will not be relieved until the cæcum is released from its abnormal position, as shown in Fig. 18. This patient had been ill for months with symptoms of chronic appendicitis. He consulted several surgeons, and while the diagnosis was not altogether clear, surgical operation for the examination of the right iliac fossa and the probable removal of the appendix was advised by several surgeons. At the operation the ileocolic junction could not be found; but in its place had been felt on palpation an abnormally placed sigmoid. The operator's presumption was that the cæcum and appendix were both behind the posterior peritoneum of the pelvis, but he hesitated to open this space.

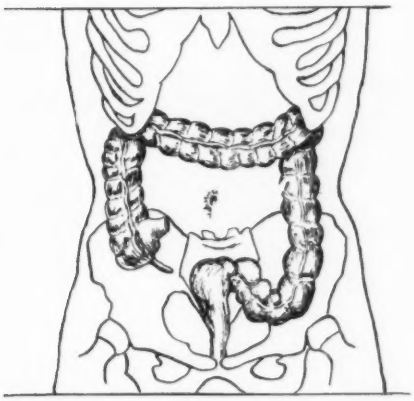
Algrave reports two cases in which the cæcum and sigmoid were both in the right iliac fossa and adherent. The author says: "It is not uncommon on opening the abdomen of adults and even more of infants to find the sigmoid flexure and the cæcum in contact and more or less located in the right iliac fossa; but with the exception noted, we have always found the sigmoid mobile and independent and the descending colon was always in its customary place." He says, "The adhesions between the cæcum and descending colon appeared to be a physiological coalescence, certainly not due to any inflammatory process." According to Virchow, Simpson, and others, it would seem that such adhesions might be due to intra-uterine peritonitis. A number of observers speak of fetal peritonitis as an explanation of adhesions where there is no history of peritonitis after birth, and attribute changes of position of the colon to this cause (Treves, B. Robinson, Shober). The history of peritonitis is often uncertain. I have seen two cases of ruptured appendix and abscess where the patients disclaimed any special discomfort up to the moment of rupture, and were never in bed on account of illness until they were operated on. The case reported in this paper

had too many hard, strong, and constricting adhesions to be considered as belonging to that class reported by Hofmeister, Lane, Jackson, and others. This case had a distinct history of violent appendicitis, which would amply account for the adhesions. Several of the cases illustrated reported bands of "adhesions" which held the displaced segment of gut, and many of the authors discussed the origin of these bands. In the absence of a history of peritonitis they are frequently described as "congenital." The presence of bands of connective tissue across peritoneal surfaces is certainly abnormal, and whether they are described as a "physiological coalescence," a "membrane," or "veil-like adhesions," they must all arise from practically the same process of irritation of the serous surface, which leads to the formation of new connective tissue and blood-vessels, which under ordinary conditions we call peritonitis. The pathology of these various conditions is so similar in its results as to appear identical. Practically there is good authority for the belief that many bands and constrictions begin *in utero* while others are developed so insidiously as to escape attention until the contractions and fixations produce symptoms. Fraser, in reporting the case illustrated by Fig. 16, says that he made careful examinations of over 1500 abdominal cavities and that "this is the only time I have found the lateral half of the abdominal wall clear of colon behind."

Cuibe reports a case in which the descending colon crossed the mid-line until it was in contact with the cæcum and was found adherent to the appendix. The sigmoid was in the right iliac fossa. This case has several points in common with my case, but diarrhœa is not mentioned as a symptom. In fact in no report examined is diarrhœa enumerated as an important symptom, as it was in my case.

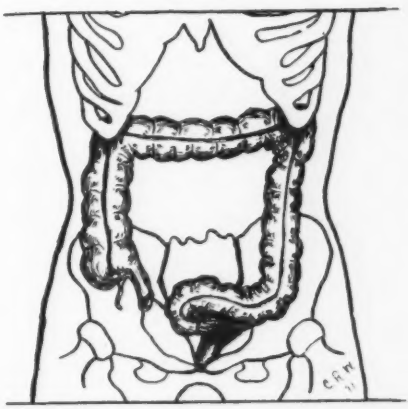
Fig. 6 illustrates a case reported by J. Chiene in which the sigmoid "was tied down in the right iliac fossa." In many of the cases, especially the older reports, nothing is said about adhesions, but in the face of acute inflammation of the adnexa, appendix, or gall-bladder it is easy to see how easily the displaced loop could become seriously involved. Several

FIG. 1.



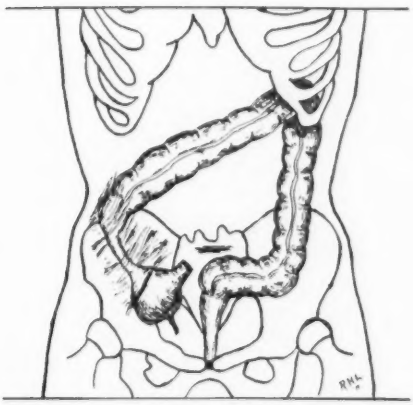
Course of colon as usually described. (Henry, Gray, "Anatomy, Descriptive and Surgical," 1905, p. 1311.)

FIG. 2.



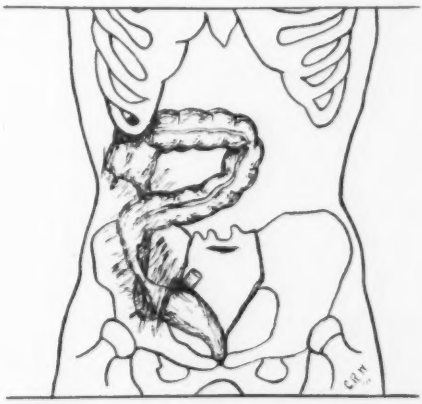
Course of colon as frequently described. (James P. Tuttle, "Diseases of Anus, Rectum and Pelvic Colon," 1902, p. 39.)

FIG. 3.



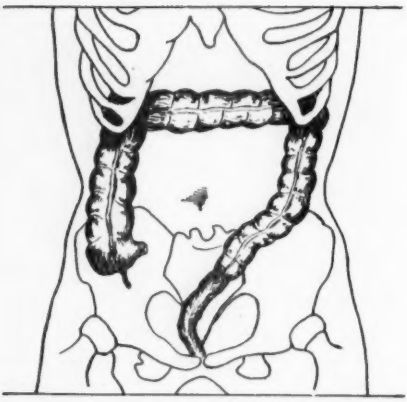
Condition thought to be narrowing of the cæcum and ascending colon, found at primary operation in author's case. History of appendicitis, and large gut found constricted by adhesions.

FIG. 4.



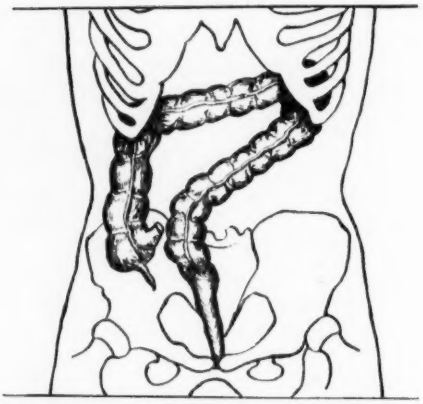
Condition demonstrated by secondary operation in author's case. The constricted large gut was the junction of the descending colon and sigmoid, which were displaced into the right iliac fossa. The cæcum was high up near the liver.

FIG. 5.



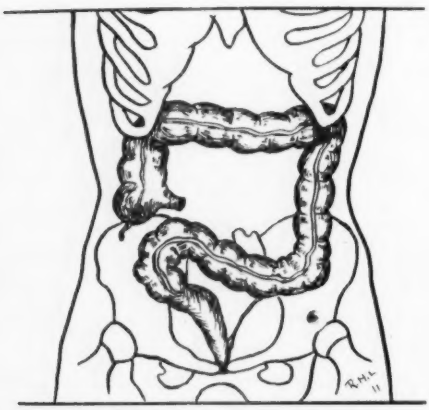
Case where "there was shifting of rectum to right side, the sigmoid descending into the pelvis over promontory of the sacrum." (W. Gruber in *Arch. f. Path. Anat.*, etc., Berlin, 1865, vol. xxxii, p. 94.)

FIG. 6.



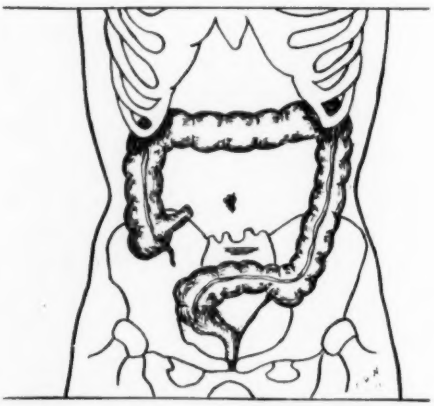
Case where "the sigmoid flexure passed across the right iliac fossa before it entered the pelvis on the right side of the middle line." (J. Chiene, *Jour. Anat. and Phys.*, London, 1867–9, vol. ii, p. 14.)

FIG. 7.



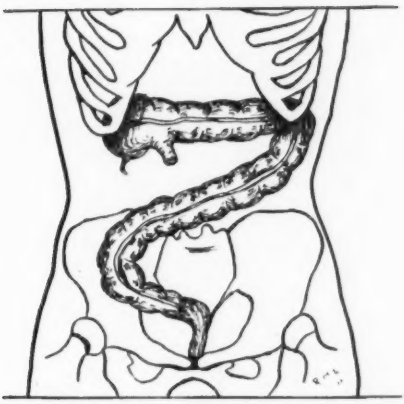
Case of a boy 7 years old with sigmoid on right side. (J. Reid, Edinburg, *Med. and Surg. Jour.*, 1836, vol. xlvi, p. 70.)

FIG. 8.



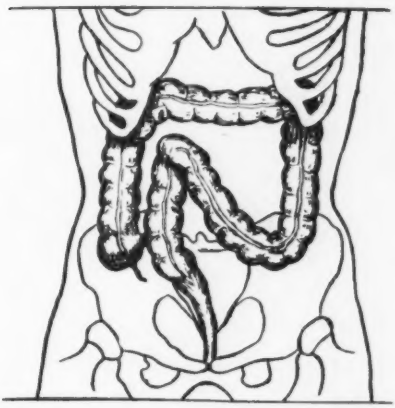
"The sigmoid circled the left iliac fossa, lying close behind Poupart's ligament, then ran back along the left margin of the pelvis, across the sacrum, to the right side and then down into the pelvis." (D. E. Mundell, *Dominion Med. Mo., and Ont. Med. Jour.*, 1895, vol. xxxix.)

FIG. 9.



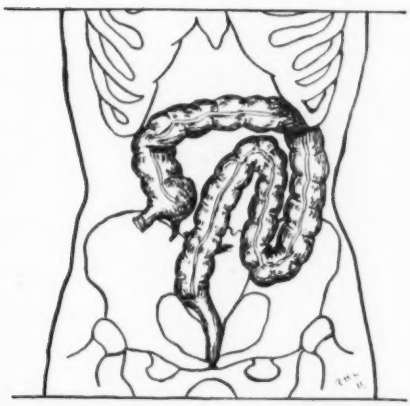
"The cæcum was found in the right hypochondriac region in close proximity to the gall-bladder; the appendix vermiformis was normal in structure and pointed downward. The sigmoid flexure occupied the usual position of the cæcum on the right side. There were no peritoneal adhesions present." (A. Farenhott, *Boston Med. and Surg. Jour.*, 1894, vol. cxxxi, p. 427.)

FIG. 10.



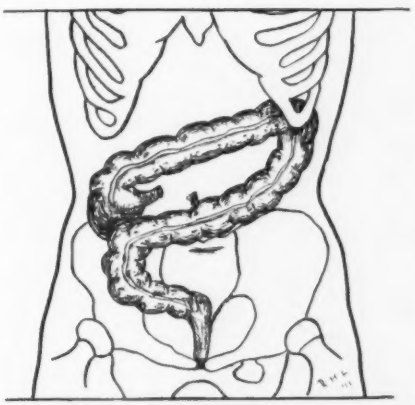
"Fatal case of obstruction and enormous distention of belly arising from a peculiar conformation of the colon." (A. Buchanan, *London Med. Gaz.*, 1839, vol. xi.)

FIG. 11.



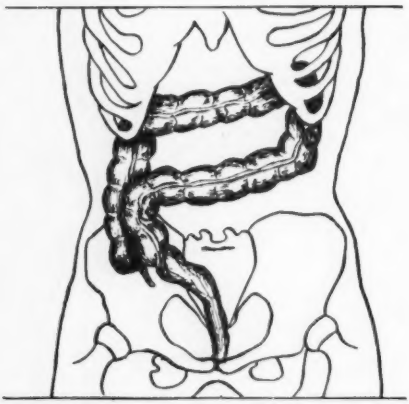
"The cause of this seems to be some fetal pathological adhesion between the cæcum and lower end of the omega-loop." The ileum enters cæcum from the right, showing arrested rotation." (W. S. Melsome, *Jour. Anat. and Phys.*, 1893, vol. xxx, p. 27.)

FIG. 12.



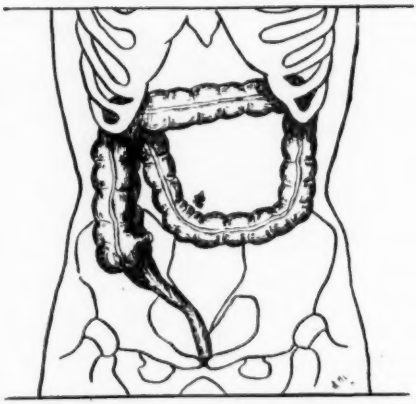
"The usual site of the cæcum was occupied by the sigmoid flexure, which, passing transversely across the body of the fourth lumbar vertebra, formed a bend in the right iliac fossa and then ran down into the pelvis on the right side. The cæcum was high in the lumbar region." (D. E. Mundell, *Dominion Med. Mo. and Ont. Med. Jour.*, 1895, vol. xxxix.)

FIG. 13.



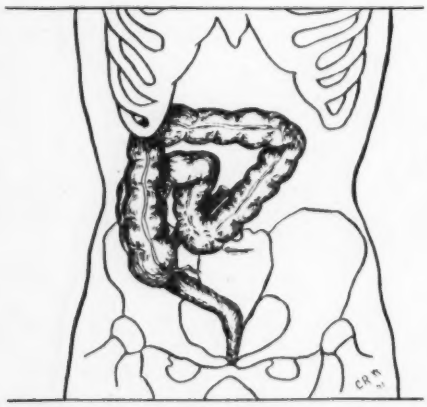
The small intestines were in front of the colon. The author says: "This is congenital because the sigmoid and descending colon cross behind the origin of the mesentery—it differs from those cases where the sigmoid gets into the right iliac fossa because of a long mesentery." (E. E. Maddock, *Jour. Anat. and Phys.*, Lond., 1882–3, vol. xvii, p. 403.)

FIG. 14.



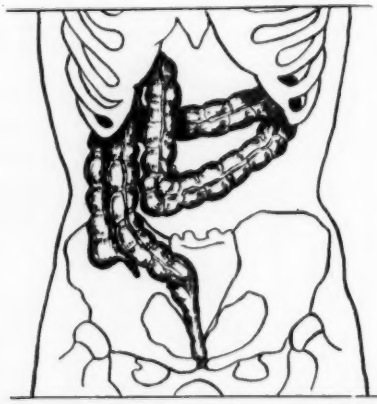
Due to unusually long mesentery. The author says the attachments of the ascending and transverse colon "were so long that they could be drawn into any region of the abdomen." (J. Barton, *Trans. Royal Acad. Med.*, Ireland, 1889, vol. vii.)

FIG. 15.



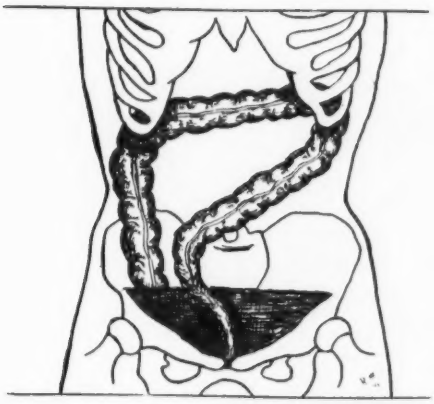
The whole extent of the colon was placed behind the peritoneum, which covered only its anterior aspect. The root of the pelvic mesocolon was in contact with the cæcum. (Hamdy and Fahmy, *Jour. Anat. and Phys.*, vol. xliii, p. 242.)

FIG. 16.



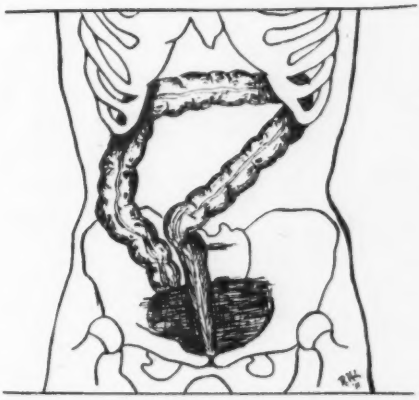
Long loop of descending colon and sigmoid reaching as high up as right vault of diaphragm, lying between the muscle and the liver. (Alec. Fraser, F.R.C.S., Prof. Anat. R.C.S., *Tr. Royal Acad. Med.*, Dublin, Ireland, 1905, vol. xxiii, p. 400.)

FIG. 17.



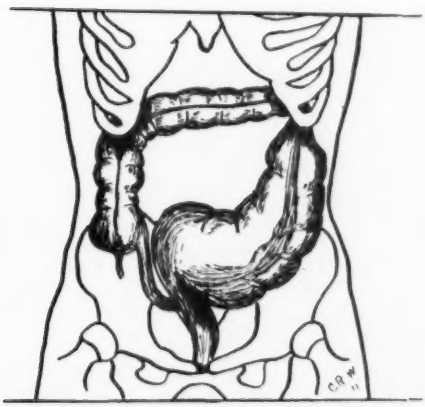
"Case where the descending colon crossed the vertebral column obliquely and the sigmoid and rectum descended on the right side of the pelvis," and the cæcum was buried behind the pelvic peritoneum. (W. Gruber, *Arch. f. Path. Anat.*, etc., Berlin, 1865, vol. xxxii, p. 94.)

FIG. 18.



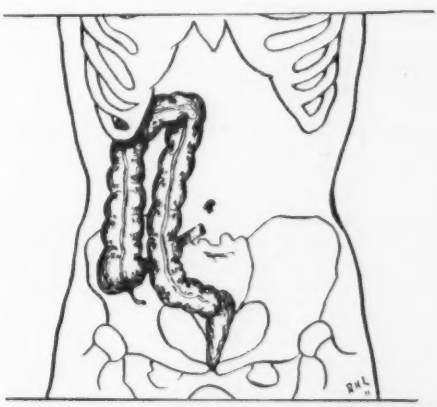
Exploratory operation by Edward Martin. Diagnosis appendicitis. "The part felt on palpation was the abnormally placed sigmoid. Cæcum and appendix buried beneath the pelvic peritoneum. No attempt to remove appendix." (John B. Shober, *Am. J. Med. Sci.*, Oct., 1898, p. 403.)

FIG. 19.



Sigmoid and descending colon distended from obstruction. Illustrates how the adhesions may have begun in author's case, Fig. 4. (Adapted from Kelly–Noble, p. 398.)

FIG. 20.



"Transverse colon folded upon itself at level of gall-bladder; the descending colon located in the right flank parallel to the ascending colon; the sigmoid flexure was in contact with the cæcum; the rectum occupied its accustomed place." (M. Mascarel, *Bull. de la Soc. Anat. de Paris*, 1840–42, vol. xiv, p. 213.)

FIG. 21.

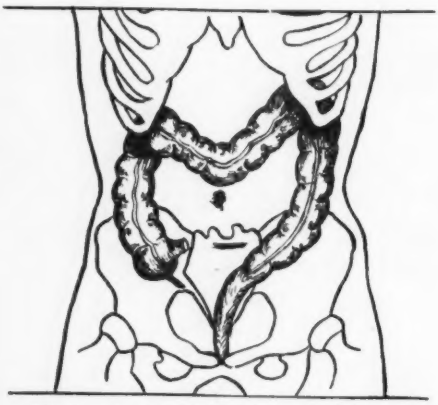


Fig. 61, Case V. V-shaped course of the transverse colon. The appendix lies behind cæcum within the layers of the mesocæcum. (Boardman Reed, "Diseases of the Stomach and Intestines," 1911, p. 450.)

FIG. 22.

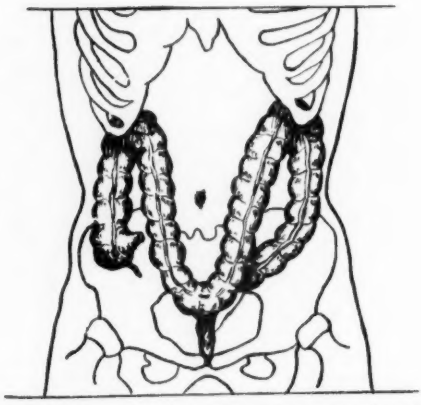


Fig. 62, Case VI. Exaggerated V-shaped course of the transverse colon. (Boardman Reed, "Diseases of the Stomach and Intestines," 1911, p. 450.)

FIG. 23.

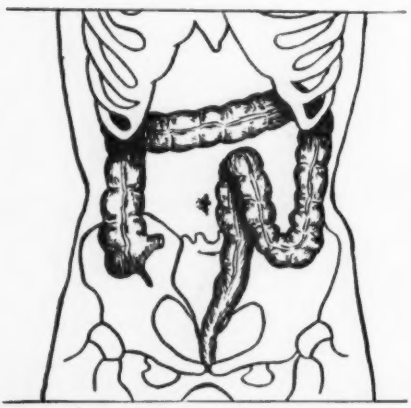


Fig. 58, Case II. Elongation and displacement of the sigmoid flexure. (Boardman Reed, "Diseases of the Stomach and Intestines," 1911, p. 447.)

FIG. 24.

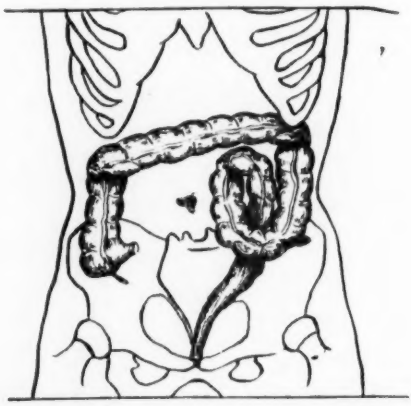


Fig. 59, Case III. The sigmoid loop touches the lower border of the left kidney. (Boardman Reed, "Diseases of the Stomach and Intestines," 1911, p. 448.)

FIG. 25.

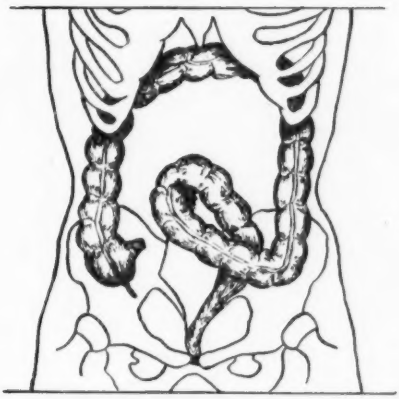
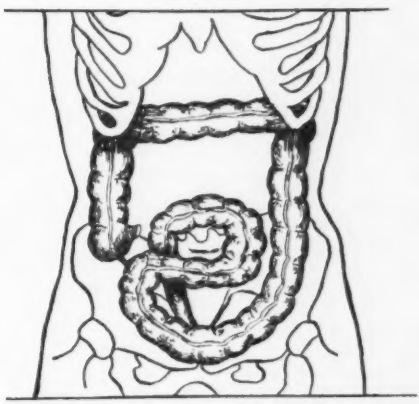


Fig. 60, Case IV. Exaggerated and displaced sigmoid loop. (Boardman Reed, "Diseases of the Stomach and Intestines," 1911, p. 449.)

FIG. 26.



Case of obstinate constipation. There was obstruction due to a twist where the colon terminated into the rectum, and a patient died with great distention. (A. Buchanan, *Lond. Med. Gaz.*, 1840, vol. ii, p. 99.)

FIG. 27.

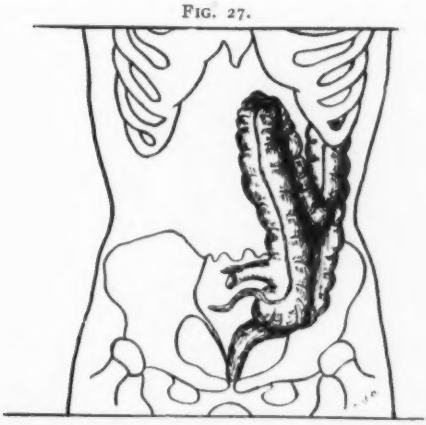


Fig. 118. Abdominal viscera of adult human female, in a case of arrested rotation of the intestines. (Columbia University Museum, Study Collection.) (Geo. S. Huntington, "The Anatomy of the Human Peritoneum and Abdominal Cavity," 1903, p. 60.)

FIG. 28.

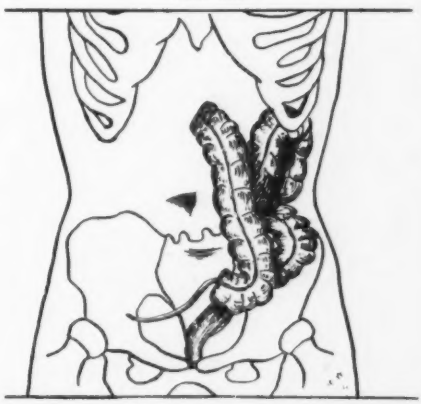


Fig. 121. Abdominal viscera of adult human; non-rotation of intestine. (Columbia University Museum, Study Collection.) (Geo. S. Huntington, "The Anatomy of the Human Peritoneum and Abdominal Cavity," 1903, p. 60.)

FIG. 29.

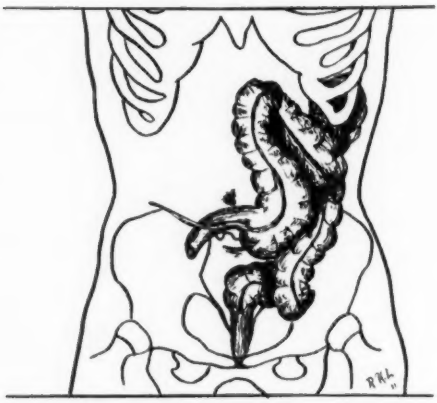


Fig. 120. Abdominal viscera of adult human male; non-rotation of intestines. (Columbia University Museum, Study Collection.) (Geo. S. Huntington, "The Anatomy of the Human Peritoneum and Abdominal Cavity," 1903, p. 60.)

FIG. 30.

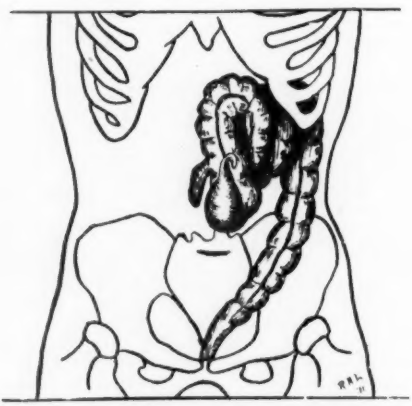


Fig. 122. Abdominal viscera of child two years old; non-rotation of intestine. (Columbia University Museum, Study Collection.) (Geo. S. Huntington, "The Anatomy of the Human Peritoneum and Abdominal Cavity," 1903, p. 60.)

reports speak of peritonitis and adhesions as a cause of the displacement, while the inflammatory process may not be the direct cause of the displacement, yet a loop of colon with a long, free mesentery or a loop enormously distended, as illustrated in Fig. 19, may easily be displaced toward an inflammatory area and become bound down by adhesions. It would seem evident from some of the cases reported that the sigmoid was displaced after the descent of the cæcum from the fact that it is in front of the cæcum. This is illustrated by Figs. 13 and 16; while Figs. 14 and 15 illustrate cases in which the cæcum seemed to have descended after the sigmoid was displaced as it lay in front of the sigmoid loop. The displacement of the long sigmoid loop and the cæcum is the most frequent and most easily understood. Both are usually congenital in their origin, but may be exaggerated by other conditions. Most of the displacements are combinations of the congenital and the acquired. Figs. 7, 9, 11, and 12 illustrate cases in which the descent of the cæcum is incomplete—a congenital abnormality; and in Fig. 11 the ileocæcal junction has not rotated to the left, but still maintains the fetal position. Some authors seem to think the descending colon is more commonly in its normal position than almost any other portion, but the cases I have examined do not bear out that assumption and 9 out of the 28 cases illustrated show the descending colon markedly out of its normal position. This is an important consideration in lumbar colotomy. My defeat was due to being too sure that we were dealing with the cæcum and ascending colon, when in fact we were dealing with the descending colon and sigmoid. Mundell has called attention to the difficulty of finding the appendix where the cæcum is displaced upward or downward. The presence of the appendices epiploicæ on the sigmoid and their absence on the cæcum are of great importance. If the landmarks are in the least doubt, the whole cavity should be searched until the position of the whole colon is understood. Mascarel's case, illustrated by Fig. 20, is the only case found among a large number of reports in which the colon did not approach the spleen.

GANGRENE OF ILEUM COMPLICATING APPENDICITIS.*

BY JOSEPH WIENER, M.D.,
OF NEW YORK,
Associate Surgeon, Mount Sinai Hospital.

GANGRENE of the cæcum or of the adjacent portion of the ileum is not such a rare complication of neglected cases of appendicitis. In these cases we assume that the gangrene is the result of a direct extension of the inflammatory process around the appendix. In some of these cases it is probable that the thrombosis extends from the vessels of the appendix along the mesentery to the terminal vessels supplying the contiguous parts of cæcum and ileum. But this paper does not deal with this form of intestinal gangrene, rather with a gangrene of the ileum at some distance from the ileocæcal valve, with normal ileum intervening between the gangrenous portion and the cæcum, and with the cæcum normal. A careful search of the literature has failed to reveal a single case on record similar to the one we are to report.

As it is evident that the pathological condition we are dealing with must have been preceded by changes in the blood-vessels supplying the intestine, it may be well to briefly refer to the anatomy of these vessels.

The superior mesenteric vein returns the blood from the small intestines and from the colon as far down as the splenic flexure. It corresponds with the distribution of the branches of the superior mesenteric artery, and unites behind the pancreas with the splenic vein to form the portal vein.

To quote from Gray's "Anatomy":

"The superior mesenteric artery supplies the whole length of the small intestine, except the first part of the duodenum; it also supplies the cæcum, ascending, and transverse colon; it is a vessel of large size,

* Read before the Surgical Section of the N. Y. Academy of Medicine, February 2, 1912.

arising from the fore part of the aorta about a quarter of an inch below the cœliac axis. . . . It passes forward, between the pancreas and transverse portion of the duodenum, crosses in front of this portion of the intestine, and descends between the layers of the mesentery to the right iliac fossa, where it terminates, considerably diminished in size." The branches of this artery which supply the ileum and cæcum are the vasa intestini tenuis and the ileocolic artery. "The ileocolic artery is the lowest branch given off from the concavity of the superior mesenteric artery. It descends between the layers of the mesentery to the right iliac fossa, where it divides into two branches. Of these, the inferior one inosculates with the lowest branches of the vasa intestini tenuis, from the convexity of which branches proceed to supply the termination of the ileum, the cæcum and appendix, and the ileocæcal valve. The superior division inosculates with the colica dextra and supplies the commencement of the colon."

As the portion of the ileum which became gangrenous in our case was eight inches from the ileocæcal valve, the lower branches of the vasa intestini tenuis and the inferior branch of the ileocolic artery must have been thrombosed. It is of course fair to assume that the primary thrombosis was in the veins, and secondarily affected the arteries. This tendency to thrombosis in cases of appendicitis is, with increasing experience, becoming more generally recognized. Sonnenburg emphatically draws attention to this fact, and states that every appendicular exudate, whether purulent or not, affects the adjoining veins. He further states that every patient with appendicitis, whether acute or chronic, is a possible thrombus carrier. Sudden deaths during the convalescence from operations for appendicitis are unfortunately known to us all, and most of them are to be traced to emboli.

In 1903, Dandridge, of Cincinnati, reported to the American Surgical Association a case of gangrene of colon and ileum after an operation for appendicitis.

The patient was a man of twenty-six who had had eight previous attacks of appendicitis in the preceding two years. When seen he had been sick ten days, and there was a tumor in the right iliac fossa. The temperature was 101.4° F., and the pulse slow. At operation the tumor proved to be an inflammatory mass on the inner side of the cæcum. To quote from Dandridge's paper: "It was thought to be a mass of exudation about the appendix, and I at once proceeded to enucleate it with the

finger. When partly separated a vessel of some size was seen to penetrate and pass through it, so that the pulsation could be felt beyond. It was necessary therefore to ligate the vessel before the removal was completed. The parts removed proved to be some enlarged glands. The appendix was subsequently found behind the cæcum. It was three inches long, reddened, thickened, the tip being enlarged." There were no adhesions present and no pus. The wound was closed without drainage. The bowels moved daily for several days and the temperature was normal. On the seventh day the stitches were removed and the wound had apparently healed. Thirty-six hours later there was severe pain in the right side and the dressings were found saturated with fæces. Gas and fæces were found escaping from the upper angle of the wound. The entire wound was opened and a gangrenous loop of intestine was found projecting into the wound. The sloughing mass was cut away, and it was found to come from the colon, but apparently it did not involve the entire circumference of the colon. On the next day a further portion of sloughing intestine had escaped from the wound, and it was likewise removed. A day or two later a piece of small intestine nine inches long was washed out of the wound. From the pieces removed it was estimated that fifteen inches of small intestine and cæcum had sloughed away. Thereafter there was a daily profuse fecal discharge from the wound and no stool came from the rectum. Forty-nine days after the first operation through a left rectus incision a side-to-side ileocolostomy was done, using the transverse colon. The wound was closed without drainage. This wound healed, but the fecal fistula on the right side persisted, although thereafter some fæces came through the rectum. A hundred and forty days after the second operation, an end-to-end anastomosis was made between the open ends of ileum and colon by means of a Murphy button. Following this operation most of the stool was passed per rectum, but a small fecal fistula persisted. Later two attempts were made to close this fistula by operation, but both failed. Various colostomy pads were tried, and a final closure was brought about by the pressure of a rubber sponge held in place by an elastic bandage around the waist. The entire treatment stretched over ten months. Dandridge believes that a branch of the ileocolic artery was tied at the original operation and that the intestinal gangrene was caused thereby.

The history of the author's case is as follows:

Mrs. R. N., fifty-seven years old, a native of Austria, had been in this country 29 years. Her father had died of cardiac disease at 76; and her mother of old age, at 75 years. Two sisters had died, one of pulmonary tuberculosis at 28 years, another after an operation for an abdominal tumor at 45 years. Two brothers and one sister were alive and well. At the age of 24 she had typhoid fever. She had been married 30 years, and had never been pregnant. In 1900 she had developed a

severe neurasthenia, and from 1900 to 1905, according to the husband's story, she had been a nervous wreck. She had suffered from constipation for more than 20 years; for the past 15 years she had taken cathartics, during the past few years almost daily. Her appetite had always been good.

In 1900 she had her first attack of abdominal pain. It started suddenly at night, with vomiting, and pain in the right iliac fossa. After four or five days in bed the pain subsided, but the patient kept quiet for two weeks. Four weeks later there was a similar but milder attack, that kept the patient in bed a few days. Following this second attack there was no abdominal disturbance for five years. Then there was slight abdominal discomfort at times for a few years, but no pronounced attack. In June, 1909, after an attack of influenza, there was a third attack of right iliac pain, associated with vomiting. This attack kept the patient in bed for a few days; and, as in the previous attacks, ice was applied to the abdomen. In August, 1909, after running for a train, she complained of severe precordial pain. This persisted for a few days and ever since then slight exertion brings on the precordial pain, which is associated with palpitation.

In March, 1910, the patient awoke one night with vomiting, and pain in the right iliac fossa; there was some fever at this time. This fourth attack was more severe than the preceding ones and kept her in bed for ten days. Following this attack there was almost continuous pain and discomfort in the right iliac fossa until June, 1910. During these three months the patient was on a careful diet, her appetite was fair, but she felt weak and was below par. In June, 1910, the abdominal symptoms disappeared, the general condition improved very much, and she spent the summer at the seashore. During this entire summer there were no symptoms referable to the abdomen. From October 10 to October 15 she complained of loss of appetite and general malaise, but no pain. During this time, as during the several years preceding, the bowels had moved with daily cathartics. On October 15, at 1 A.M., the patient awoke with severe right iliac pain, and vomited several times. The pain persisted and there was some fever; the bowels moved with a cathartic. On the following day she again had a severe abdominal pain and a hypodermic injection of morphine was

given. Twelve hours later the pain again became severe and she again began to vomit. On the day of operation she had severe pain all day, and vomited everything she took. The bowels had moved daily with cathartics. No blood or mucus had been noticed in the stools.

The writer first saw the patient on October 17, 1910, about 9 P.M., in consultation with Dr. A. R. Stern of New York and Dr. Joseph Baum of Far Rockaway. She did not make the impression of being seriously ill. The facial expression was not anxious, although she was very pale. The tongue was moist and coated. The abdomen was uniformly moderately distended. Liver dulness was not obliterated, and there was no evidence of fluid in the abdomen. A rather fat abdomen made the examination difficult, and no definite mass could be felt. There was some general abdominal tenderness, which was very marked in the right iliac fossa, and there was decided muscular rigidity in the right lower quadrant. Rectal examination was negative. The temperature was 101° F. and the pulse 106. We all three concurred in the diagnosis of a perforative appendicitis; and the patient was taken to St. Joseph's Hospital, Far Rockaway, in the vicinity of which she had been stopping. While we were making preparations for operation Dr. Howard Lilienthal was called in consultation. He agreed with the conclusions at which we had arrived. The writer then proceeded with the operation in the presence of Drs. Baum, Stern, and Lilienthal.

The abdomen was opened through an incision between the fibres of the right rectus muscle. There was some turbid fluid in the peritoneal cavity, and there was some injection of the peritoneum. Low down in the right iliac fossa a mass of adherent intestine was found. The adhesions were fairly firm, but could be freed with the finger without much difficult. The appendix was found below and to the inner side of the cæcum, from which it had almost completely sloughed away. It was surrounded by a small amount of pus. A loop of small intestine, which had formed part of the wall of this potential abscess cavity, was found to be completely denuded of its mesentery. The vessels in this portion of the mesentery had thrombosed, and there was no bleeding throughout the entire operation. The loop of intestine affected was in the ileum about ten inches from the ileocæcal junction, and was about eight inches long.

Owing to the presence of a peritonitis and of pus in the abdomen, the writer did not believe that the patient would survive an immediate intestinal resection. The other gentlemen present concurred in this opinion. What was left of the appendix was quickly tied off, the affected loop of ileum was surrounded by gauze packings, and the entire wound, which was about three inches long, was left open. Several wide strips of zinc oxide plaster were passed around the abdomen to prevent prolapse of abdominal contents. The time of operation was about 30 minutes. Unfortunately we had no facilities for making cultures from the pus.

In view of the grave condition found at operation, we were somewhat surprised to find the patient in good condition on the following morning. Pulse and temperature were almost normal, and she had only vomited once. There was a moderate serous discharge from the wound and a little abdominal distention. On the third day there was a copious movement from the rectum, and this was followed by a daily bowel movement until the eighth day after operation. On that day there was a foul discharge from the wound, and on investigation we found that the loop of ileum in the wound had become completely gangrenous. It was cut away without any pain, and thereafter all stool came from the wound. During the first two weeks after operation the temperature only once rose about 100° F. The movements were semiformed and fluid and came from the wound many times a day, and in consequence we had much trouble in preventing the skin from becoming excoriated. Three weeks after operation the wound was granulating rapidly. The finger in the wound could feel two openings into the intestine, one at the upper angle of the wound and one at the lower. We tried repeatedly to keep a rubber tube in the proximal opening of the bowel in order to drain away the stool. A small tube would not remain in the bowel, and a large one caused so much pain that we had to abandon it. As the wound contracted, the two openings of the bowel came closer and closer together; and frequently at the dressings the writer would introduce the tip of the finger into the opening of the distal loop, as it had a tendency to contract. It did not seem possible that nature would ever bring about a spontaneous anastomosis of the two ends of gut in the wound, but yet we were anxious to keep the distal loop patent,

and the granulating wound had a tendency to cover it over. On November 24, thirty-eight days after operation, we experienced considerable difficulty in getting the tip of the finger into the distal opening of the gut. When we finally succeeded, we could feel some adhesions give way and the patient complained of pain. On the following day we were somewhat alarmed to hear that there had been a chill accompanied by vomiting, some abdominal distention, and a temperature of 102° F.; and the patient complained of severe pain around the wound. This was undoubtedly due to a local peritonitis, following the breaking up of adhesions in dilating the opening of the gut. After a few days the local peritonitis subsided, and we were gratified to find that stool began to be passed by rectum.

Thereafter the wound granulated rapidly and soon almost all stool was coming through the rectum. On December 20, 1910, the patient was transferred to Mount Sinai Hospital. She was then having daily movements with enemata, and there was a small fecal fistula at the site of the wound. The rest of the wound had healed firmly by granulation. During all this time there was no abdominal pain and no distention. We were unable to understand how the two loops of intestine could have grown together, after such an extensive gangrene, without forming a stricture of the gut. Subsequently we found that such a stricture had indeed been formed; and it was only the patent fistula that prevented its giving symptoms. On January 18, 1911, there was so little discharge from the fistula that the patient was allowed to go to her home. After a very few days, however, there were symptoms of partial intestinal obstruction, nausea, and abdominal cramps. These symptoms promptly subsided when the fistula, which had apparently closed, reopened and discharged profusely. This phenomenon repeated itself several times during the ensuing two months.

The patient was readmitted to Mount Sinai Hospital January 24, 1911. During the succeeding six weeks, frequently while the writer was examining the fistula the patient would complain of a sharp abdominal pain, and a few moments later gas and fæces would be expelled from the fistula and the pain would instantly cease. As no further improvement was to be expected without interference, we decided to do an ileocolostomy. We carefully weighed the pros and cons of closing the ileum distally

to the point of anastomosis. We finally decided that if the wall of the gut was in good condition, and if the anastomosis could be rapidly done, we might attempt a closure of the ileum.

Operation (March 6, 1911).—Side-to-side ileocolostomy. The abdomen was opened through a seven-inch incision through the left rectus near the median line. There were extensive adhesions between the loops of small intestine in the right iliac fossa. Considerable time was spent in freeing the ileum, and its damaged serosa had to be repaired in several places. A side-to-side anastomosis between the ileum twelve inches from the ileocæcal valve and the middle of the transverse colon was made with Connell sutures of linen. The method of suture was that of the Moynihan gastro-enterostomy. The opening was made about an inch and a half long, and the abdomen was closed without drainage. Although the actual anastomosis took but fifteen minutes, the entire operation consumed an hour and a quarter, the greater part of which was devoted to freeing intestinal adhesions and covering over areas denuded of serosa. In view of the extensive adhesions and the length of time already consumed, it was not deemed advisable to attempt to close the ileum distal to the point of anastomosis.

We hoped that most of the fecal current would be side-tracked through the new opening, and that we would then be able to bring about a closure of the fecal fistula still remaining without further operation. In this we were disappointed. The amount of fecal discharge was not materially affected by the ileocolostomy. Most of the stool came from the rectum, but the dressings had to be changed several times a day on account of fecal discharge from the wound.

All through the after-treatment it was difficult to prevent loose bowels. We gave large amounts of opium, dermatol, tannalbin, tannigen, and calcium phosphate, but still the bowels were not constipated. The most careful dieting was of no avail. At one time we starved the patient for five days, giving nothing by mouth but small amounts of water and opium. And yet at the end of these five days there was profuse diarrhœa. The patient was of a very neurotic temperament. She worried a great deal about her condition, and this may have contributed to the looseness of the bowels.

Frequently, both before and after the second operation, the

patient would have severe attacks of colicky pain in the right side of the abdomen, which we attributed to gas passing through the strictured portion of the ileum at the site of the former gangrene. These attacks of pain came on suddenly, lasted a few minutes, and then suddenly ceased. Passing the rectal tube gave no relief, and no gas would be passed at the time of the relief from pain.

The fistula was cauterized several times with the actual cautery, and many astringents were injected; bismuth paste was also tried repeatedly. At times there was a profuse discharge of gas from the fistula, at times the fecal discharge was moderate, at times profuse. Pressure pads and strapping of the abdomen were of no avail.

Third operation, April 24, 1911, 188 days after the first. Excision of ileum, cæcum, and ascending colon. The abdomen was opened through a long median incision. The intestinal adhesions were so extensive that it was difficult to acquaint oneself with the anatomical relations. After freeing many adhesions the ileocolic anastomosis was exposed. The ileum distal to the anastomosis was very friable and the adhesions very dense. In freeing the ileum its lumen was opened near the anastomosis. Clamps were applied to the rent, and we decided to work backward from the ascending colon. The mesocolon was tied off almost up to the hepatic flexure and the colon divided high up. The distal end of the colon was closed with three layers of sutures and the omentum sewed over it. The cæcum and adjacent portion of ileum were so tightly adherent to the anterior abdominal wall at the site of the fecal fistula that some of the abdominal wall had to be cut away to release the gut. The mesentery of the ileum was then tied off as far as the site of the ileocolic anastomosis, and the ileum cut away. The open end of the ileum was closed with three layers of sutures, the last layer taking in part of the wall of the transverse colon at the site of the anastomosis. The wall of the ileum was friable, and we were much concerned about the possibility of a subsequent fecal fistula at this point. Fortunately, however, this did not occur. The wall of the ascending colon was in good condition, and we felt confident that at this point the sutures would hold, especially as we had sewed the omentum over the suture line. However, this suture line was in close proximity to the

old fecal fistula, and in that way probably the suture line became infected, and we had a temporary fecal fistula, to which we will refer below. The abdominal incision was closed without drainage, but a cigarette drain was inserted at the site of the old fecal fistula. The entire operation was an extremely difficult one, partly on account of very extensive adhesions, and partly on account of the friable condition of the gut. In spite of rapid work, one and a half hours were consumed. About ten inches of ileum and twelve inches of large intestine were removed. The ileum showed a stricture near the ileocæcal valve where the intestine had become gangrenous, following the first operation, and where the fecal fistula had existed.

Dr. Howard Lilienthal was present at this operation, as well as at the two previous ones, and it is a pleasure to express our gratitude to him for much kindly counsel. It is difficult to give an idea of the conditions as we found them at this operation, conditions resulting from the two previous operations and the consequent extensive intra-abdominal adhesions. Most landmarks were obliterated, and we had great difficulty in carrying out the operation as we had planned it. In fact it looked at one time not only to us, but to some of the others present, as if the operation presented insurmountable difficulties.

Following the operation the patient was kept in Fowler's position, water was given in small quantities by mouth, and nothing by rectum. She reacted well, the highest temperature was 101.6° F., and the pulse did not go above 108. There was no abdominal distention, flatus was passed on the third day, and on the following day flatus and fæces. At the first dressing five days after the operation the upper part of the wound was found to have broken down, and there was some purulent discharge. Two days later there was some fecal discharge from the wound. Thereafter there was daily a moderate fecal discharge from the wound, and the bowels moved daily. After three weeks the fecal discharge began to diminish. A week later there were some days on which there was no discharge, and then for a day there would be a slight discharge. During all this time the wound was granulating rapidly. Occasionally some water from an enema would come out of the wound. As the wound contracted the fecal discharge steadily diminished. After July 8, 1911, there was no further discharge,

and on July 18 the patient left the hospital with a completely healed wound. Six months later the wound was still firmly healed, the bowels moved daily without cathartics or enemata, and the general condition was excellent.

The writer has reported the case in extenso: first, because a fairly thorough search of the literature fails to reveal a similar one; second, because it shows that nature can bring about an intestinal anastomosis in a wound, even after complete gangrene of eight inches of gut; third, because it shows the futility of expecting the fecal current to be completely diverted by a side-to-side ileocolostomy, without occlusion of the ileum; fourth, because it demonstrates the great advantages of two- or three-stage operations.

We believe that a primary intestinal resection in this case, in the presence of peritonitis and of an abscess, would have been a fatal blunder. Had we attempted a complete intestinal exclusion, or an intestinal resection, at the second operation, we do not believe the result would have been satisfactory. By doing a preliminary ileocolostomy, the final stage of intestinal resection was a very much safer procedure.

APPENDICITIS IN AN INFANT SIXTEEN DAYS OLD WITH APPENDIX IN AN INGUINAL HERNIAL SAC.

BY CHARLES M. REMSEN, M.D.,

OF ATLANTA, GA.

INTEREST is attached to the following case not only because of the extreme youth of the patient, but also from the peculiarity of the local signs in connection with the condition revealed at operation.

The history of this patient was more or less unsatisfactory, due to the fact that the mother's recent delivery had prevented her from appearing with the child.

C. E. S., male, aged sixteen days, was admitted for treatment to the Johns Hopkins Hospital May 24, 1911, on account of persistent vomiting, with red colored stools.

The infant had been born 16 days before in the obstetrical service of the hospital after a normal labor. Patient nursed every two to three hours. Stools perfectly normal at first.

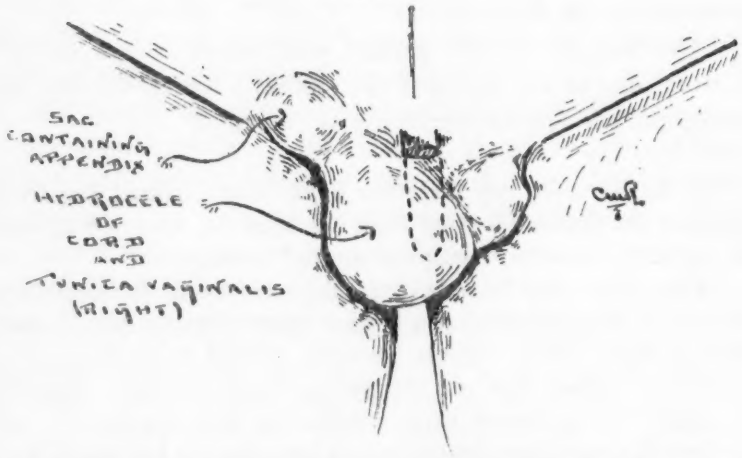
When twelve days old the patient began to vomit, and this persisted "every two or three minutes for first two days." Following this, vomiting became much less marked but stools were lumpy and red. Child cried nearly all the time. Took breast fairly well but often stopped on account of paroxysms of pain in the abdomen. May 23 a lump was noticed in the inguinal region (right side) which was extremely tender on palpation.

When admitted to the ward the infant was very restless, continually crying, and jerking its extremities about very actively. Somewhat emaciated, though not very markedly so. Facial expression showed patient to be in great pain at times. Upon physical examination it was found that from the right external abdominal ring protruded a swelling which filled the ring completely on the one hand, and on the other extended well down to the lower limits of the scrotum and surrounded the testicle and cord so that it was impossible to palpate these. At its lower end its diameter was about 3 cm., while at the point of emergence from the ring it was about 1.5 cm. across. There was a definite

constriction about one-third the distance from the ring, which seemed to divide the swelling more or less completely into two parts. The lower part was semifluctuant and seemed to be tender. Higher up in the upper part above the constriction there was imparted to the finger a sensation as though there were fluid under tension. At this part there was definitely more tenderness, as evidenced by the child's struggles and cries. Percussion over the swelling everywhere was dull.

Immediate operation was determined upon, and it was deemed best to make the primary incision over the tumor.

FIG. 1.



Swelling extending from external ring to scrotal base—showing constriction.

An incision above and diverging from Poupart's ligament (right) was carried through the skin. The aponeurosis of the external oblique was divided parallel to its fibres from the external ring upward a distance of 4 to 5 cm. Underlying this was the continuation of the tense sac which had been felt as the portion of the tumor above the constriction. Below this was an entirely separate sac with similar properties reaching along the cord to the bottom of the scrotum. On opening this latter we found merely a hydrocele involving the tunica vaginalis and a part of the cord. On opening the upper sac we found that we were dealing with a definite hernial sac in which there was a markedly inflamed, indurated, and reddened appendix, on the surface of which were numerous splotches of fibrin. The usual lustrous appearance of this organ had given way to a dull, roughened

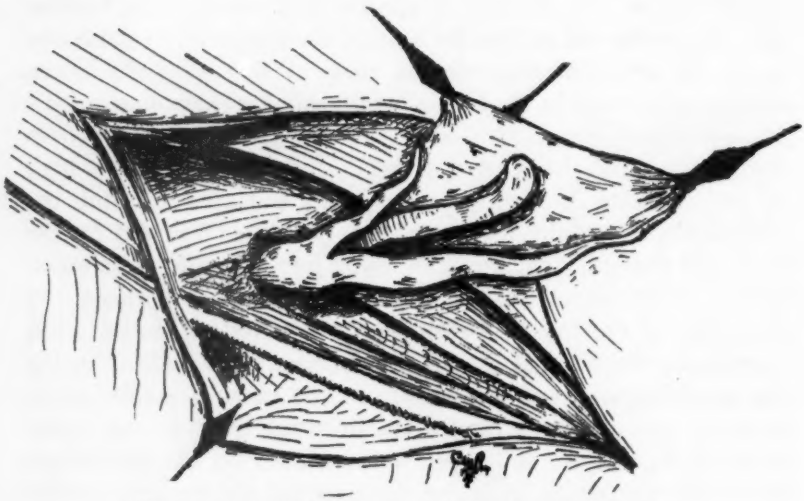
surface. There were no signs of perforation anywhere. The distal half of the appendix, which was quite long (about 8 cm.), was caught in the hernial pouch and glued in this position by an outpouring of fibrin and the presence of some early delicate adhesions. The proximal half of the appendix was contained in the general peritoneal cavity and the hernial sac, at its neck, approximately bisected this organ. No bowel was in the sac, and the neck of the sac was neither strong enough nor tight enough to have caused strangulation of the appendix. On loosening the latter from its bed in the hernial sac there was no difficulty in withdrawing that organ from the peritoneal cavity; and indeed enough cæcum was forced through the neck to allow the turning back of a peritoneal cuff on the base of the appendix, to crush and ligate the muscular and mucous coats at this point, to ligate, excise, and to turn in the base after carbolizing the stump, with a purse-string of fine black silk. The vessels in the mesappendix were ligated with the same material. After tying off the sac high up and allowing it to drop back into its bed after excising the redundant portion, the lower sac was attacked. This was for the most part excised, a small portion being left—enough to manufacture a small tunica vaginalis in order to avoid perhaps any difficulties in the future development of the testicle on this side. Fortunately the internal oblique did not have to be divided during the appendectomy, and the closure of the canal was effected by drawing the cremaster under the internal oblique, the lower leaflet of the external oblique aponeurosis over the internal oblique and finally the upper leaflet of the external oblique aponeurosis over the lower leaflet of the same structure. The skin was closed with continuous suture.

Patient made an uneventful recovery and left the hospital 10 days later at the age of twenty-six days. Inspection of the child about six weeks later showed its general condition to be normal. Locally the seat of operation showed a firm ring, through which the cord passed into the scrotum. Cord normal. Testicle normal. No evidence of any existing hernia.

It is interesting to note the lack of any special tenderness or muscular rigidity or spasm in the right iliac fossa and the presence of blood in the stools in this case. In association with this, the lack of any masses suggesting intussusception and local signs practically limited to the right inguinal canal and

along the cord to the scrotum, the persistent vomiting, with the absence, however, of any peristalsis or distention, helped to make somewhat more difficult the unravelling of this condition. The general condition spoke against obstruction—at least against complete obstruction—yet appendicitis was not so strongly considered, even though the presence of an appendix in a hernial sac, either femoral or inguinal, is of course not a very rare occurrence. Most definite of all were the local signs, and it was here that we were misled into

FIG. 2.



Hernial sac, opened to show acutely inflamed appendix therein.

concurring with the diagnosis made on the outside, which was corrected only at the operating table.

Signs and symptoms corresponded when the true nature of the condition was exposed, and not less interesting than the condition and position of the appendix was the complication of blood in the stools—this in all probability being an example of one of the rare cases in which such a sign is associated with an acutely inflamed appendix.

I wish to express my appreciation to Dr. William S. Halsted, in whose service I was at the time I operated on this patient, for his kindness in allowing me to report this case.

PRIMARY SARCOMA OF THE SPLEEN.

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THE rare occurrence of the condition herein described seems to warrant the report of a case. That primary neoplasm of the spleen is not often met with authorities agree, but as to why this is true, no convincing explanation is offered. In speculating on the possible cause of its rarity Bush [1] suggests the mechanical protection from trauma, which from its anatomical position the spleen enjoys, and again its inaccessibility by direct extension along fascial planes.

In discussing the diagnosis, Rolleston [2] suggests that: "The clinical aspect of the cases consists mainly in the presence of a splenic tumor; if irregularities can be felt on the surface of the spleen there is good ground for deciding that it is not chronic splenic anæmia, which has often been described as primary malignant disease of the organ." According to Moynihan [3]: "There is nothing characteristic in the symptoms or in the blood changes in cases of sarcoma of the spleen. The one clinical feature presented is an abdominal tumor."

Bush [1] believes that the diagnosis must be made by exclusion. "I think it should usually be made with some probability. The pain will bring the patient, and enlargement of the spleen will be found. Then comes the routine exclusion of the other forms of splenic enlargement—a matter of no great difficulty as a rule."

Jepson and Albert [4] think we are dependent upon finding: "(1) enlargement of the spleen, (2) pain, (3) blood changes." In the first, irregularity of the growth seems worthy of strong consideration; while much dependence cannot be placed in the expected rapidity of the growth. Pain is not a constant symptom, nor from the cases studied does the blood examination seem to be of any real diagnostic value.

A solid growth in the spleen is, then, the basis for diagnosis. In the case here reported the findings are pain and a tumor, nothing indicative being found in the blood examination.

The various types of malignant disease of the spleen are mentioned by Jepson and Albert [4] in their discussion of the treatment of sarcomatous spleen by extirpation. They write: "Thus the spleen offers three types of connective tissue from which it may originate. First, the capsule and trabeculæ; second, lymphoid structure; and third, the endothelial cells which give rise respectively to the fibrosarcomata, lymphosarcomata, and endothelial sarcoma." These types are found in the cases reported, the lymphosarcoma predominating.

In a recent paper McConnell [5] expresses the belief that many of the cases heretofore considered malignant under the latter classification very probably belong to the class of endothelial hyperplasias resulting from chemical irritations. He thinks the results of splenectomies in these cases are uniformly too good for the condition to have been actually one of malignancy. He makes a thorough pathological study of a case, which in 1908 was considered a perithelial sarcoma or endothelioma in a man of twenty-nine. The more recent study suggests that "a diagnosis of perithelioma or more correctly endothelioma could be made, the growth probably originating from the endothelial cells adjacent to the blood spaces."

In 1904 Jepson and Albert [4] made a careful study of primary sarcoma of the spleen, reviewing at that time thoroughly the literature on the subject. They were able to collect 31 cases and reported an additional one, making all told 32 cases in the literature prior to 1904.

They credit the first report of a case to Friedreich, endorsing Bunting's classification of the case of multiple nodular hyperplasia of the liver and spleen, reported in 1865, as a case of primary endothelial sarcoma of the spleen. Two cases, a "primary endothelial sarcoma," and a "primary fibrosarcoma" of the spleen (post-mortem findings), were reported by Weichselbaum in 1881. Then follows a complete list of the cases they have been able to collect, some of which

are considered doubtful. Of the possible 32 cases, 12 were subjected to operation, 11 being splenectomies and 1 enucleation. The latter, the case of Heinricus, was a pedunculated tumor supposed at the time of operation to be benign (fibroma), but later shown by microscopic examination to be fibrosarcoma arising from the capsule of the gland and undergoing myxomatous degeneration. The tumor was enucleated, the patient dying, seven days after the operation. Of the 11 splenectomies 3 died following operation (Flotmann, Krylow, and Warren). Of the surviving 8 cases, as regards 1 (case of Herczel), of the " subsequent history nothing is known " and 3 others died of recurrence (Billroth, Jordan, and Kocher) at indefinite periods after operation. The remaining 4 cases were free from recurrence at the time of report, respectively case of Fritch after six and one-half years, Wagner's after four years, Garre's after four months, and Jepson and Albert's after ten months.

Classification of the growth in these twelve cases: primary sarcoma (1), primary fibrosarcoma (2), primary lymphosarcoma (3), primary small round-celled sarcoma (4), with one case classified as primary endothelial sarcoma, Bunting, or as round-celled sarcoma, Marchand.

Study of the literature since the review made by Jepson and Albert shows four cases reported within the last eight years that may be accepted as primary sarcoma of the spleen. There are two other possible cases. Swan [7] in 1908 made a cytologic examination of a case diagnosticated clinically as malignant disease of the liver and spleen. In this case no autopsy was allowed. Hess,[8] 1910, found an unusually small number of leucocytes with enlargement of the spleen accompanying a primary neoplasm of the spleen. McConnell's opinion as to the type of tumor in his 1908 [6] case has changed somewhat, and he does not now consider it a case of sarcoma.[5]

In 1906 POWER[9] reported a round-celled sarcoma of the spleen in a woman of 49, the mother of ten children and four years past the menopause. She complained of pain and a swelling in the abdomen. In her past history was " rheumatic fever " 23 years before, following which she was completely blind for six months. About eight months before patient

was seen, she was seized suddenly with a pain in the left side of her abdomen. Pain with frequent vomiting persisted for a week and then gradually disappeared. Six months later a swelling in the left side of abdomen was noticed, when the pain and nausea returned and persisted until she was admitted to the hospital. An abdominal tumor was found extending from the costal margin to the anterior superior spine of the ilium and beyond the mid-line in front. This was tense and smooth except for an irregular surface just below and to the left of the umbilicus near which the only tender spot was found. The mass was thought to be splenic in origin. The tumor which was attached to the omentum proved to be spleen and was removed, weighing 66 ounces. An accessory spleen was left in position. The patient was discharged one month later after an uneventful recovery.

Pathology.—A primary sarcomatous new growth of the spleen which had undergone extensive necrosis, found to be a round-celled sarcoma. Patient was able to attend to household duties for few weeks, but failed gradually and died six months later. The presence of the accessory spleen prevented a determination of the effect of splenectomy upon the blood picture, no change being noted.

In 1907 HENDON[10] reported a case of round-celled sarcoma of the spleen in a married woman of 45, mother of four children. She was seen one year before in consultation, at which time she complained of obstinate constipation; "a hard but movable mass situated in the hypochondrium" was found. Operation was advised, but was declined. On second examination tumor was materially increased in size, but patient complained chiefly of "weariness and weakness felt upon the slightest exertion." Splenectomy was done, patient returning home in three weeks. Gross weight of tumor four and one-half pounds. Microscopic examination showed it to be "round-celled sarcoma." Four months later "no untoward symptoms" had developed, patient attending to her duties on the farm without discomfort.

In 1909 MAYO[11] reported a case, a married woman of 41, who at eight to ten years of age had repeated attacks of malaria, but none for 15 years. After birth of last child (four years previously) patient noticed enlargement in region of spleen, which was not again noticed until seven months before examination. During the past four to six months there had been some dyspnœa with anæmia. Examination showed a well-nourished but anæmic woman with a "huge tumor extending from fifth rib down across abdomen one inch past mid-line into pelvis, notched. Liver extended one inch below costal margin." Hæmoglobin 50 per cent.; red blood cells, 4,504,000; white blood cells, 4000. Splenectomy (Nov. 14, 1905), removing a small piece of the tail of the pancreas to which the tumor was adherent. Some free ascitic fluid, recovery good. "Pathologic report, lymphosarcoma of spleen, weighing 2375 Gm." More than three years afterward patient was in splendid health, having gained 40 pounds in weight. More than six years later, Dr. Mayo kindly reports, "The patient is very well now, I think."

In 1910 BUSH[1] reported a case of primary sarcoma of the spleen. This was in a man of 48, complaining of pain in the left side. There was

no history of lues, and patient had taken one drink of whiskey daily "for years." "Three years before he fell heavily on his back across a beam, striking in the splenic region." This did not prevent his working, though there was pain for six weeks, which gradually disappeared. Pain at that time, which was similar to pain at present illness, was relieved to a great extent by turning on the left side.

When seen, patient had been experiencing pain in the left side for eight weeks following a long railroad journey. This pain had been increasing in intensity and change of posture gave no relief. Had lost in weight about 20 pounds. Examination: "Hard, slightly irregular tumor in the left hypochondrium, emerging from under the ribs toward the navel on deep breathing. It was superficial but not tender, filled the upper half of the flank, but had its lower border higher than the level of the umbilicus. The area of splenic dulness was greatly increased. When inflated, the stomach lay to its right. The tympany of the colon reached the edge of the tumor below, but did not pass in front of it. The mass was evidently the spleen." Examination otherwise negative. No glands felt. "The liver did not exceed its normal size." White blood cells 8900, polymorphonuclears 75 per cent. It was planned to operate in six days. On afternoon of third day patient took long street car ride. That night he fell to floor of room in a faint, was readily revived, put to bed with quick pulse. In the morning patient was seen to be in collapse with a probable rupture of the spleen. Salt solution was given per rectum and subcutaneously, and an hour later, patient having rallied somewhat, the abdomen was opened. Leucocyte count 27,000, polynuclear leucocytes 90 per cent. On surface of spleen were one or two whitish bosses suggesting sarcoma. Rupture with active hemorrhage was found. This was packed and patient gradually regained strength, hæmoglobin rising to 60 per cent. Six days later splenectomy was performed, when there was found to be some oozing from the tail of the pancreas which had been adherent to the spleen; cigarette drain placed to this point.

Four hours later there was collapse, from which patient slowly rallied. At this time there was thought to be "acute dilatation of the colon or stomach due to the removal of the large spleen and the readjustment of the neighboring viscera." Three weeks later drain was removed under nitrous oxide anæsthesia, previous attempts having been unsuccessful because of pain induced in the attempt. White blood cells following operation 28,000, polymorphonuclears 90 per cent.; hæmoglobin persisted low, 60 per cent. Five weeks after operation the pain, which had persisted, became intense and was referred mostly to the liver, which had enlarged almost to the umbilicus. Patient rallied somewhat, but after three or four months began to lose steadily and to have increased pain. Death six months later from metastatic recurrence.

The spleen on section showed a number of separate, well-circumscribed nodules of new growths varying from 3 cm. to 7 cm. across, the smaller being "grayish and translucent, the largest whitish and necrotic in centre." The pathologist reported "large-celled sarcoma," and in view of negative examination of abdomen was considered primary sar-

coma of spleen. "Death was due to recurrence in the region of the wound." Autopsy showed that death came from general recurrence. Dr Bush reviews the case as sarcoma of the spleen in strong man following suggestive injury some three years before. Growth was rapid, accompanied by pain, and leading to rupture. Death from recurrence six months later. "Autopsy showed that metastasis had occurred in three ways: (1) through the blood stream to both lungs, as the nodules were scattered uniformly; (2) through the lymphatics to neighboring glands and tissues; (3) probably by direct implantation from cells in the free cavity falling on the peritoneum of the bowel." Splenic tissue in the main displaced by large sarcomatous cells with very active karyokinesis.

AUTHOR'S CASE.—The case here reported, B. R. C., age fifty-eight, was referred by Dr. W. H. Bramblitt to Dr. H. H. Trout and admitted to Jefferson Surgical Hospital August 8, 1911, complaining of "floating kidney" with occasional attacks of abdominal pain. In family history, mother probably died of cancer; one brother has pulmonary tuberculosis; two brothers died of "heart disease," and one brother now suffers from some renal disease.

A satisfactory personal history was never obtained, the essential points in that as obtained being as follows: As child had measles, mumps, whooping-cough, and chicken-pox. At age of five scarlet fever with complicating otitis, which has since at times given him much trouble. Following scarlet fever patient had "fits," which cleared up after twelve years of age. No history of malaria and patient was never jaundiced. Pneumonia fourteen years ago (age forty-four). Subject to "bilious headache." For six years dyspnœa on exertion with œdema of feet and ankles. Appetite good with regular daily bowel movement. For ten or twelve years some "kidney trouble," which seems to have consisted of frequent attacks (every three or four weeks) of kidney colic, at which times he would have severe cramp-like pains in right hypochondrium and in lumbar back. He associated this with polyuria, frequently dysuria, followed by much burning. Eighteen months ago "passed bladder stone which was four days in passage." "Rheumatism all of life," but joints are never red or swollen. Denies all venereal infection, but says left testicle has been tender for years. This he attributes to lifting very heavy weight some years ago when he experienced sharp pain in left side and iliac region. For four or five years has been taking large quantities of two popular "kidneys cures" and enormous amounts of "Nervine."

Was first married at thirty-one, three living children, one child lived eighteen months, and one "still birth." Second marriage at forty-two with four living children and with no miscarriages. Wife died two and one-half years ago, suddenly of heart disease.

Prior to twelve years ago drank enormous amounts of "raw whiskey" and used much strong tobacco. He began use of morphia twenty years ago for headaches and earache.

For eighteen months patient has done no work, suffering frequently severe attacks of dysuria. Two years ago his physician told him of presence of a mass in the abdomen and that he probably had floating kidney. He has experienced much abdominal pain, saying that he has frequent attacks of "something like cramp," lasting three to ten days. Has taken great quantities of medicine and admits now taking five to eight grains of morphia daily.

He was ignorant of presence of tumor until it was pointed out to him by physician.

Physical examination shows a pale, emaciated man of small stature, whose face bears a peculiar anxious expression. No general glandular enlargement, though there are palpable supraclaviculars on left, no marked pigmentation. Pupils rather small, equal, and react to light and accommodation. Ears show no tophi or discharge. Nose negative. Throat injected; pulse equal with fair volume and tension; regular, 76 to the minute. Peripheral vessels show marked arteriosclerosis. Chest shows very poor expansion, which is most marked on left, this being markedly retracted; lungs clear throughout.

Heart shows no enlargement. Point of maximum impulse in fifth left intercostal space 9 cm. from mid-sternal line; except for snapping reduplication of second sound at the apex, the heart sounds are everywhere clear. Abdomen shows thin walls, no muscle spasm, no tenderness, and no liver enlargement. On left is small inguinal hernia. Both testicles in scrotum with marked tenderness of left. On left side of scrotum is small non-pigmented, non-pedunculated tumor about 5 cm. in diameter. Knee-jerks active, but not exaggerated.

In abdomen is felt a movable mass, apparently about 8 x 16 cm., lying in left hypochondrium. Pointing diagonally across abdomen toward right iliac region. Mass is not tender and seems to have some deep attachment in umbilical region.

Dulness seems continuous with that of spleen, but the latter cannot be outlined and no edge felt. The stomach lies to the right of it and no suggestion of overlying intestine. Blood examination: white blood cells 20,200; differential polymorphonuclears 68.5 per cent.; polymorphonuclear leucocytes 1 per cent.; polymorphonuclear eosinophiles, 5 per cent.; lymphocytes, 26 per cent.; large mononuclears, 3 per cent.; unclassified, 1 per cent.

On admission, patient's urine was of low specific gravity, otherwise negative. Fourteen days were spent in preparing patient for laparotomy, gradually taking him off his morphia. During this time the course of the disease was rather uneventful, symptoms largely those of restless and extremely nervous state of the habitué. He at times complained of aching and dull pains in abdomen, but at no time did these seem acute and the inclination was to attribute these complaints to effort on part of patient to secure drugs.

On fourteenth day (Aug. 22, 1911) the condition seemed favorable for operation. Left rectus incision was made, and on opening the peritoneum a large mass was readily seen. It was found attached to transverse colon and to portion of omentum, which attachments were released. Two large vessels entered the mass through an omental band; these were severed and mass removed *in toto*. Examination of abdomen revealed a normal liver and gall-bladder, both kidneys in normal position, the left being somewhat enlarged. No spleen or portion thereof could be found remaining. Patient made uneventful recovery, only complaining of some pain in abdomen and begging for opiates. Patient's temperature was very even throughout course, averaging 98.5°. He regained strength rather rapidly and was discharged on the thirtieth day after operation, weighing 77 pounds and able to walk well. White blood cells at discharge 12,200, hæmoglobin 70 per cent. Six months after splenectomy patient has gained 35 pounds, passes for a well man, suffers no pain, eats and sleeps well, face is good color, and in every way physically in better condition than before operation. He has used no morphia since leaving the hospital.

The tumor (Fig. 1) removed weighed (after being in preserving fluid some time) about 600 Gm., measuring roughly 9 cm. by 27 cm. total length. The tumor really consists of three masses connected by fibrous bands. The upper portion "A" lying nearest the diaphragm resembles in external appearance a kidney and measures 3 x 6 x 9 cm. Section shows

FIG. 1.

A, *B*, and *C*, as described in the text. *P*, pedicle containing artery, vein, and glands.

an outer cortical portion of ⅔ thickness presenting a pigmented fatty homogenous appearance with a "pelvic" portion of browner color. The surface is irregular (not sharply nodular), and entire edge resembles very much anterior edge of liver. The mid-portion "B" measures 3½ x 7 x 12 cm., presenting irregular surfaces, and from its lower pole is broad omental attachment containing vessels (a. v. lienales). Section "B" presents grayish-brown mottled appearance such as seen in "A," except that there is no kidney arrangement. The third most dependent portion, "C," is attached to "B" by the pedicle just mentioned. This measures 2 x 6 x 11 cm. and it too presents a flattened kidney appearance with pelvic-like attachment. While section of this is also mottled, there are larger areas which resemble more closely the normal splenic pulp.

The histological examination showed the tumor to be a mixed-celled sarcoma with very little of splenic pulp remaining. Here then is a case of primary mixed-celled sarcoma of the spleen in a man of fifty-eight who for ten or twelve years has suffered attacks of severe abdominal pain. In years past he has taken large amounts of alcohol and in recent years quantities of opiates. There is a definite history of injury followed by severe pain in the left side. Blood examination revealed no definite findings.

Following splenectomy there was an uneventful recovery and marked improvement. The patient is in excellent condition now, more than six months after the operation.

According to Swan:[7] "The cytological examination of fluids removed from the serous cavities of the body is an important method of case study, which, if pursued systematically, may in the future develop to such a point as to give evidence which will be of value in diagnosticating individual cases." In his case the diagnosis of malignant disease of the liver and the spleen was made, but an autopsy was not permitted to confirm this opinion. A thorough cytologic study of the blood and ascitic fluid was made, the result of the latter leading him to believe "that there was an active phagocytosis of the large tumor cells that resembled lymphocytes so closely." In the case here reported, as in the other four cases studied, no aid to diagnosis is to be found in the examination of the blood picture.

In the symptomatology of these five cases there are three in which the pain was intense, while in a fourth there was only slight pain, the fifth complaining only of "weariness and weakness." The one constant finding was the abdominal tumor. One of the cases gave a history of malaria and two

of the five gave a definite history of injury. All of these cases were treated by splenectomy, with the results that two (Power's and Bush's) died six months after the operation; one (Hendon's) was well four months, one (Trout's) six months, and one (Mayo's) six years after splenectomy.

The five cases here considered taken with the 32 cases reviewed by Jepson and Albert in 1904 make 37 cases of sarcoma of the spleen to be found in the literature.

Of the 17 cases that came to the operating table, one was for enucleation and 16 for splenectomies. Of these pain as a symptom is mentioned in only 8, while a tumor is described in 15—notes on the tumor being wanting in two of the cases. In the possible etiology, a record of injury is found in only three and of malaria in only two cases.

These 17 cases of primary tumors of the spleen were given this classification: endothelial sarcoma or round-celled sarcoma, one; primary sarcoma, one; large-celled sarcoma, one; mixed-celled sarcoma, one; fibrosarcoma, two; lymphosarcoma, five; round-celled sarcoma, six. As to the result of treatment, one case died seven days after enucleation of the tumor. Of the 16 splenectomies one case was lost sight of, three died following the operation, five died of recurrence at indefinite periods, and the remaining seven were well at the time they were reported—at periods ranging from four months to six and one-half years after the operation.

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BEVAN'S OPERATION FOR UNDESCENDED TESTICLE.*

WITH A SUGGESTION AS TO ONE FACTOR CAUSING UNDESCENDED TESTICLE.

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THE subject of the surgical treatment of undescended testicle has received an increasing amount of attention in recent years, and many valuable clinical and a few experimental studies on the subject have appeared during that time. The attitude of surgeons has undergone a very marked change, as the rapidly accumulating reports as to the value of operation in the correction of the deformity have appeared in the literature, and operations are now undertaken with a degree of hopefulness as to the prognosis which was unknown a comparatively short time ago. Indeed, we have reached a period where the light-hearted sacrifice of an undescended testicle, even though very poorly developed, is not to be countenanced by the conscientious operator until a carefully planned procedure for its scrotal implantation has been proven unfeasible.

It is not necessary to dwell at length on the physical and mental features which are often associated with cryptorchidism and to a lesser extent with monorchidism, and it must be at once confessed that for some of these, surgical measures do not offer certain relief. The spermatogenic function of the undescended testicle may be and probably usually is absent, according to the observations of those with most experience in this field; while, according to others, it is lost at a comparatively early period of life. If it is to be preserved at all, the scrotal implantation before the age of puberty would seem to be the most rational measure to be recommended.

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Even where spermatogenesis is entirely absent, the preservation of the internal secretion, which is so essential to the development of manly physical and mental characteristics, is of primary importance to the individual, and this is never to be sacrificed by deliberate castration unless the indications are exceedingly well defined.

The recognition of the important fact that in all or nearly all cases of undescended testicle there is either a hernia present, or a potential one due to the presence of an open vaginal process of peritoneum, is a very strong indication for attempted radical cure of both hernia and non-descent. Coley [1] dwells upon the rarity of strangulation of the hernia cases, he having personally operated on but one, a strangulation of the omentum, while not one case has been admitted to the Hospital for Ruptured and Crippled. Erdmann,[2] in the same discussion, recalled four or five cases of strangulation in hernias of this type on which he had operated, and we recall that the first case of strangulated hernia which we ever saw operated upon was associated with undescended testicle and was in Dr. Deaver's service at the German Hospital during our student days.

Aside from the accident of strangulation, cure of the hernia is impossible without operation, and truss treatment is often painful and ineffectual. Repeated attacks of epididymo-orchitis are frequently observed. Torsion of the cord is an ever-present danger, and malignant disease of the testicle, while not of frequent occurrence, is certainly predisposed to by non-descent of the organ, every theoretical condition favoring malignant growth being provided (Von Foth [3]).

The modern operation for undescended testicle would probably date from 1881, when M. Schüller first recommended division of the tunica vaginalis as an aid to bringing down the testicle, and this measure, in connection with high ligation or suture of the neck of the vaginal process, is now a recognized feature of all operations. Schüller also sutured the testicle to the bottom of the scrotum to prevent its subsequent retraction. The futility of such suture, without previous

lengthening of and relief of tension upon the spermatic cord, is now appreciated. In such cases the scrotum is simply invaginated by traction of the cord and testicle upon it, and follows the testicle unwillingly but surely in the direction of the external ring, leaving a funnel-shaped depression instead of the normal scrotal fulness.

Moschcowitz[4] reviews the numerous and ingenious methods devised to bring down the testicle and to prevent relapse. Among these continuous traction on the testicle as a means of lengthening the cord has been practised (Lanz), sutures being passed through the fascial coverings of the organ and the bottom of the scrotum, and fastened to external wire supports or cages, or to the thigh, or even by a long cord to the big toe. The Keetley-Torek operation is sometimes successful, complicated as it is, and moreover a two-stage operation. It consists in incision into the scrotum and the skin of the thigh, and suture of testis and scrotum to the thigh, with retention in that position until the cord is permanently lengthened, after which they are freed. Starr[5] uses a straight silver wire splint inserted into the scrotum, one end being sutured against the pubis while the other end is fastened to the bottom of the scrotum and to the testicle, holding it down, absorbable sutures being used to hold the splint in place during the process of healing, after which time the splint is withdrawn through the bottom of the scrotum.

This does not by any means complete the list. Unravelling of the epididymis has been tried and discarded (Moschcowitz), and dissection of vas and vessels free of the epididymis, so that the testicle hangs inverted, suspended with the globus major downward, has been suggested and practised (Eccles[6]).

While the operation of Bevan[7] has been before the profession since 1899, it is only recently that it has received the general recognition to which its merits entitle it. This is probably due to the fact that these cases are not too frequently offered for operation, and that the individual operator's experience grows slowly. Moschcowitz, writing less than two years ago, reported 18 cases operated upon by Bevan's method,

and states he writes, not only from a sense of pleasure which the results have afforded him, but also because the operation, if the infrequency with which it has found its way into the literature be a criterion, has thus far found few adherents.

What are the essential features of the operation? Bevan,[8] who should know if ever father knows his own child, enumerates them in the following order: incision; laying open of the inguinal canal; exposure of peritoneal pouch; division of cremaster muscle and fascia and transversalis fascia overlying it; transverse division of the sac (tunica) and ligation of upper end, as in hernia operation; purse-string closure of lower end, to form a new tunica vaginalis testis; gauze dissection of peritoneum from cord, including vas and vessels, and accompanied by division and separation of everything in the way of fibres or fascial bands from the vas and vessels, leaving these structures alone undivided. Then follows the preparation of a pocket or pouch in the same side of the scrotum, which is usually undeveloped, and after measuring the length of the cord by laying it downward upon the thigh, the testicle is placed in the scrotum and retained there by a purse-string at the base of the scrotum. Closure of the canal by the Bassini method, omitting transplantation of the cord, completes the operation. Exceptionally, and I would emphasize this, or to quote Bevan himself, "in a few cases, but these will be quite the exception," sufficient lengthening is not obtained by such free dissection of the cord to permit of the placing of the testicle well down into the scrotum, and in these cases it will be noted that the spermatic vessels, the artery and veins, and not the vas deferens, are the agents which are holding it back, and division of these vessels between ligatures is then indicated, leaving the artery and veins of the vas to care for the nutrition of the testicle, a task to which they are nearly always equal. This is Bevan's view. Moschcowitz, who is an enthusiastic advocate of the operation, states that while the cord may be sufficiently lengthened by dissection, without division of the spermatic vessels, in most cases the latter procedure is necessary to bring the testicle to the

bottom of the scrotum. In the discussion following the presentation of Moschcowitz's paper before the New York Surgical Society, W. A. Downes [9] called attention to the fact we have emphasized, viz., that division of the vessels was not considered an essential feature of the operation by its originator, to which Moschcowitz replied that, if Bevān did not so consider it, he was sorry, because he, Moschcowitz, did.

Numerous surgeons have now appreciated the merits of the operation, and it bids fair to be as much the standard in its field as the Bassini operation has been in the radical cure of hernia. Division of the spermatic vessels has been followed by necrosis of the testicle clinically, and by necrosis or fibroid degeneration in experimental procedures. Clinically, necrosis is apparently of very rare occurrence, nor have fibroid changes of slower development been noticed in the cases that have been followed for some time, although these might be present, and never detected. It seems to us that it is of the greatest importance to avoid undue interference with and limitation of the blood supply of an organ whose development we wish to foster and encourage, and we would therefore urge the preservation of the spermatic vessels where possible, at least in cases operated upon in the early years of life. It would appear to us, from our own very slender experience as well as from the observations of Bevan, that this procedure is not always necessary, and that with the exercise of great care in dissection, and that training and experience which one acquires in the performance of all radical operations on hernia in young children, and with careful division of all muscular and fascial bands, combined with a very free dissection of the peritoneal investments, sufficient lengthening of the cord can usually be obtained without it.

Nor has the hand of the surgeon been withheld from further modifications of this technic. The division of the transversalis fascia downward from the internal ring to the pubis makes a shorter path for the vas deferens from the pelvis to the external ring, although without influence on the spermatic vessels. Davisson [10] suggests in addition to such

division of the transversalis fascia, with separation of the vas, that a freeing of the spermatic vessels from the outer surface of the peritoneum, pushing them downward from that bulging membrane and abolishing the double curve which they pursue to emerge from the internal ring, is of advantage in providing a real lengthening of these structures. Dowd's suggestion, an old one, of stitching the cord to the pillars of the external ring, is good practice, if there be anything left to stitch but vas and vessels. It is immaterial whether one does or does not stitch the testis to the bottom of the scrotum. If the operation has been successful in lengthening the cord sufficiently, orchidopexy is unnecessary. If it is not successful in accomplishing such lengthening, the additional fixation will hardly save it from failure. It seems to us that preservation of the lower portion of the peritoneal process and its utilization to form a tunica vaginalis testis are important, because, as Bevan points out, in those cases in which it is excised, and this is the practice of some operators, the testicle becomes imbedded in a mass of fibrous tissue, which is unlikely to favor its functional activity.

We have followed the Bevan technic with success in six cases, and have failed in two others. The successful cases were aged 4, 12, 16, 23, and 35 respectively. In the youngest both testicles were undescended, one being abdominal. In the others the right testicle was undescended in three cases and the left in two. In three there was a distinct hernia noted in association with the undescended organ before operation, and in another there was a hernia on the opposite side, which was also operated upon at the same time. In the case of the child with double non-descent, the testicle in the right inguinal region which was associated with a hernia was operated upon. The left testicle was in the abdomen and could not be palpated. Owing to the tender age of the patient it was not operated upon. Since then it has descended almost to the external ring and will probably come down spontaneously. Three years is probably the earliest age at which operation is justifiable,

except in the presence of a strangulated or large and bothersome hernia.

We have examined four of these cases recently, two at the expiration of a year and two after six months. The results in the young men are excellent, and also in the youngest patient. In one of the boys, aged 12 years, both testicles are very small and almost buried in the subpubic fold of fat. The boy is extremely stout, and there is evidently a threatened retardation of development of virile characteristics. The operative result is fairly good.

In a very young child, operated upon mainly because of the hernia which was present, with a small and atrophic organ and a very short and poorly-developed cord, we had to remove the testicle. We had a similar experience in an adult operated upon for hernia, although, had we in this case divided the vessels, we might have had better success.

It has been emphasized by all recent operators that shortening of the vas deferens is not a cause of non-descent, its length being ample, while that of the vessels may be materially curtailed, and this shortening of the spermatic vessels has been looked upon by some as primary and a probable cause of the condition. Until the mechanism of normal descent is understood, and authorities differ widely as to its cause and mechanism, seven or eight explanations being mentioned by Eberth [11], we can only theorize as to the causes of non-descent and malposition. One possible explanation has suggested itself to us. It has seemed to us in operating on these cases that the length and position of the vas deferens, which usually lies in a loop on the surface of the vaginal process, extending down below the level of the testicle, indicate that traction on the vas itself had been made at some period, and at a point some distance from its attachment to the epididymis. An exaggerated instance of this is well shown in the illustration contained in Coley's article, where the vas extends to the bottom of the scrotum—in this case the hernial sac accompanying it, while the testicle is arrested at the external ring. The question then arises, how and by what could this traction have

been made? The rôle played by the gubernaculum Hunteri in descent of the testicle has by no means been cleared up. That it exercises at least some active or passive influence in aiding to bring down the testicle seems probable, from its position and prominence in fetal life. In fetal life, its attachment above is not to the testicle but to its ligament at a point which corresponds later to the origin of the vas deferens from the epididymis (Piersol [12]). At a still earlier stage one observes that the muscular fibres of the gubernaculum extend only to the vas deferens at a point where it crosses the vas, although later extending as far as the testicle (Eccles, *loc. cit.*). May it not be that a failure of development at this stage may result in an adhesion to the vas alone, and in traction, active or passive, on the vas rather than on the testicle itself, pulling the vas down as a loop, in which position, as we have seen, it is often found, and leaving the testicle some distance behind, at a level depending on the distance from the testicle to the point on the vas at which the gubernaculum is attached? In a recent case we have observed a band extending from the first portion of the vas to the neighborhood of the external ring, which seemed to favor this explanation. Further observations along this line are suggested.

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[12] Piersol, G. A.: Human Anatomy.

TRAUMATIC FEMORAL ANEURISM CURED BY MATAS'S METHOD OF ENDO-ANEURISMORRHAPHY.*

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As it seems likely that the cause, condition, and cure of a pathological lesion of as much consequence as an aneurism of a large artery cannot often be followed in such direct sequence and under the same observation, and as the statistics of as important and as well-designed a restorative surgical procedure should be kept as reliable as possible, I presume to report this case after a lapse of more than two years since the operation.

The Traumatism.—November 22, 1909, at Fort Logan, Col., Private N., age thirty-five years, a soldier in the United States Army, was in barracks and lying on his bed with his knees flexed and his feet resting on the floor. His thighs were thus in a horizontal position and the muscles relaxed.

A sentry, conducting a prisoner, accidentally discharged his rifle loaded with reduced powder charge ammunition, provided for guard duty, which gave a muzzle velocity to the projectile much less than that of the regular service ammunition.

The bullet travelled in a horizontal plane about the level of the bed and perforated the right thigh of Private N.

The point of entrance was on the internal aspect three inches above the adductor tubercle and one inch behind the femoral line, with the point of exit on the external aspect seven inches below the great trochanter and one inch behind a line drawn from the great trochanter to the external condyle.

There was profuse bleeding, and first aid was rendered by a comrade by the application of a tourniquet. A surgeon was soon

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in attendance, and the soldier was brought to a prepared operating room within half an hour.

The hæmostasis was so complete that there was no posterior tibial pulsation at the ankle.

The wounds in the skin were about the size of the .30 calibre projectile that had caused them, and while the history of the accident pointed plainly to the point of entrance, the wound of exit was scarcely larger or different in appearance from that of entrance, and, without the history, the identification of the respective wounds might have remained in doubt.

The femur was not broken, and the shot evidently had passed through the thigh behind the femur but very close to it.

It seemed so certain that the superficial femoral vessels in Hunter's canal had been involved in the wound that preparation for ligating these vessels was made before the tourniquet was removed.

Upon the removal of the tourniquet, however, there was no hemorrhage; pulsation returned to the posterior tibial artery, and the circulation in the leg appeared quite normal.

The wound healed without reaction and after 14 days the soldier was returned to duty with some induration along the course of the wound and a small mass above the point of entrance. He was instructed to report for examination again upon any sign of appearance of swelling in the femoral region.

The Aneurism.—February 4, 1910, this soldier reported again with a well-defined pulsating tumor about 2½ inches long and 1½ inches in diameter just above the wound near the femoral line.

As a bruit could be heard and a thrill was felt on compression, a diagnosis of traumatic aneurism, probably sacculated, in the lower portion of Hunter's canal was made.

The definite history of injury, the rapid and positive development, and the prospect of further extension and final rupture suggested operation, and the restorative procedure devised by Matas seemed clearly indicated.

The case was presented to Dr. Charles A. Powers of Denver, who confirmed the diagnosis, advised the operation, and gave me confidence to undertake it.

The Operation.—February 10, 1910, under ether anæsthesia and temporary hæmostasis by rubber bandage and tourniquet,

the case was submitted to operation. The sac was exposed in the lower portion of Hunter's canal and incised throughout the entire length.

A cavity about 2½ inches long and 1½ inches deep was revealed and only *one* opening about ¼ inch in diameter, just at the bottom, was discovered. The cavity was symmetrical in outline and the walls seemed pliable and strong, and there could be no doubt that there was only one opening and that this opening communicated directly with the superficial femoral artery, and that the bottom of the sac lay directly upon and with its long axis parallel to the artery.

The opening in the floor of the sac was closed with fine chromicized catgut on a round curved needle in a through-and-through continuous suture.

A line of continuous sutures was next taken to appose the sides of the sac walls, and here the only difficulty of the operation was encountered.

This first line of stitches pulled out on slight tension, and it was found that this was due to the fact that the internal surface of the sac wall had not been clearly exposed, but that it was covered with a dense, somewhat firm, and slightly organized, friable, fibrinous layer that would not hold the sutures. This fibrinous layer was easily stripped off and the white smooth lining of the sac laid bare.

Three lines of sutures were taken, Lembert-fashion to and fro, with one chromicized catgut strand, to bring the lower portions of the sac wall together.

The free portions of the sac walls were then inverted and whipped over with the same suture material.

The operating wound was closed by anatomical apposition, and a dressing with local pressure was applied.

With removal of the tourniquet, pulsation returned to the posterior tibial artery.

The Cure.—The exigencies of the services removed me from my station at Fort Logan about a month after the operation, and I saw the case last while the soldier was still in bed in the hospital. At that time there had been no return of the tumor, though a bruit could be heard, and the circulation in the leg was normal, although the test of physical exertion had not been applied.

An arteriovenous connection was feared, though it was believed that this condition was due to another phase of the traumatism which caused a communication between artery and vein through a channel not connected with the aneurism, as it is certain that there was only one opening in the sac, and if that opening had not been tightly closed or had not remained closed, the aneurism would have recurred.

March 16, 1910, the soldier was dicharged from the hospital and went to special duty connected with his trade as a tinner.

Dr. Powers, who saw the case before the operation and assisted at the operation, continued his interest, studied the progress, and wrote me a month later that the soldier's condition remained the same with the persistence of the bruit, but that the soldier was standing the strain of physical exertion satisfactorily.

Dr. Powers also informed me that he had written to Dr. Matas about the case and that the latter had replied with this interesting observation:

"Evidently an arteriovenous varix in which both vessels communicated with each other, opening into a common sac. In these cases the closure of a single orifice in the sac does not obliterate the arteriovenous anastomosis. It removes, I believe, however, the most dangerous feature of the lesion, *i.e.*, the sac, though the arteriovenous communication remains. I am satisfied that no further operating is required in the case, as the mere communication existing between the artery and veins involves no risk as long as the peripheral arteries are sufficiently supplied with blood to thoroughly nourish the extremities. The pulsation of both tibial arteries would suggest that only a small part of the blood is deviated in the veins.

"I am very much interested in the history of these cases which have been allowed to remain without operation. The proportion of cases in which no evil effects have followed as long as the mere arteriovenous fistula existed without an intermediate sac is very considerable and decidedly encourages the policy of non-interference as long as the peripheral nutrition on the arterial side is not diminished or affected by deviation of the arterial current into the veins. When a sac exists, however, aneurismal complications are bound to ensue in the course of time, and an operation is amply justified."

Major Shook, my successor at Fort Logan, who has kept the case under close observation, informed me, in April, 1912, that the soldier continued in the same condition with no sign of reappearing tumor but with the persistence of the bruit and was able to perform full duty, though he felt a pulsation in the leg on severe and continued exertion.

So, after this long period following the operation, during which the soldier has been able to perform his military duty, I make bold to use the word "cure" in describing the result of this restorative procedure.

TRANSACTIONS

OF THE

NEW YORK SURGICAL SOCIETY.

Stated Meeting, held at the New York Academy of Medicine, October 9, 1912.

The President, Dr. Charles L. Gibson, in the Chair.

APPENDICITIS WITH DIFFUSE PYLEPHLEBITIS.

Dr. Howard Lilienthal presented a man, 28 years old, who was admitted to the medical side of Mt. Sinai Hospital on April 22, 1912. The history he gave was that for three years he had been suffering from abdominal cramps, always associated with vomiting and constipation. He had never been jaundiced. His attacks of epigastric pain were usually uninfluenced by food or posture. Examination showed tenderness in the right subcostal and hypogastric regions. The temperature fluctuated widely, running as high as 106° F.; he had a septic appearance, and while no definite diagnosis was made, his symptoms pointed to the presence of pus, which was also indicated by the high leucocytosis.

After five days' observation, during which the patient had grown worse, Dr. Lilienthal was asked to see him and advised an exploratory operation. An incision made through the right rectus, high up, with the idea of exploring the right upper quadrant, revealed a much enlarged liver, obviously tense, perfectly smooth and red in appearance. The gall-bladder and ducts seemed to be normal. Exploration lower down showed an acute appendicitis, without perforation. The appendix was removed in the usual way, and then, believing that he had to deal with an infection of the liver, Dr. Lilienthal excised a section of liver tissue, and although this macroscopically was apparently healthy, the pathologist reported that it showed an acute, suppurative pylephlebitis.

In addition to removing a section of the liver tissue for

pathological examination, Dr. Lilienthal did a cholecystostomy in the hope of improving the drainage, and the patient was put on urotropin, from 40 to 60 grains daily. He made a good recovery, and left the hospital about six weeks later.

In some respects, Dr. Lilienthal said, he could not find a parallel to this case in surgical literature. There were, of course, many cases of multiple abscesses of the liver followed by recovery, but here we had a case of pylephlebitis in an early stage, with an enormously enlarged liver but no abscesses or other macroscopic changes. The case emphasized the fact that these were not as hopeless as the text-books would lead us to believe. It also illustrated the possible advantages of a cholecystostomy, and perhaps the large doses of urotropin had something to do with the patient's recovery.

Dr. Arpad G. Gerster said he did not think the case reported by Dr. Lilienthal was entirely unique, as quite a number of cases of pylephlebitis, with multiple abscess of the liver, with recovery, had been reported. These included cases where multiple abscesses had been incised and made confluent and then drained; other cases where the liver was simply exposed and the presence of pus demonstrated by puncture or incision and nothing further was done, and still others where the patients recovered without operation.

While this condition had long ago been described by Virchow and others, it was Chwostek of Vienna who in an excellent publication first presented the subject from the stand-point of the surgeon, and as the result of his experience he strongly discouraged surgical interference. This dictum found its way into the text-books, and still held good, because in those cases where surgical intervention had been undertaken it had never been proven that recovery would not have taken place without such interference. There were cases on record where, after recovery from this condition, the patient died from some other cause, and at the postmortem the liver was found permeated with larger or smaller cicatricial nodules, evidently the sites of old abscesses where the pus had become absorbed and had been replaced by cicatricial tissue.

Dr. Gerster said he could recall one case where an acute appendicitis was followed by pylephlebitis. The patient was very ill for several weeks; he had a septic temperature, ranging from

subnormal to 105° and 106° F. The question of an operation was discussed, but in spite of strong urging the speaker said he decided against it, and the patient finally recovered. About two years later he died from a gastric hemorrhage, and at the post-mortem, a condition of the liver similar to that described by Dr. Lilienthal was found. Here, then, was a case of pylephlebitis that was cured by nature, and the speaker said he agreed with Dr. Lilienthal, that the fatal prognosis that had been attached to this malady and had been carried through surgical literature so many years would have to be modified in the light of more modern experience. The chief indication, he thought, in the treatment of these cases was that the patients should be properly nourished and put in a condition where they could throw off the disease, as was the case with other severe local infections.

DR. LILIENTHAL, replying to Dr. Gerster, said he was not reporting this as a case of pylephlebitis with multiple abscesses that got well. The case which he showed to-night, Dr. Lilienthal said, differed from these others in that there were no macroscopic abscesses of the liver: the organ was simply very much enlarged, extremely tense, and apparently in the early stage of pylephlebitis. The diagnosis was made by the microscope.

As to whether these patients should be operated on or not, the speaker said he did not doubt that some of them would get well even if left alone, but he believed that we would get better results by doing a cholecystostomy, which permitted of freer drainage. He would certainly resort to it again under similar conditions. The urotropin was perhaps also helpful.

COMPLETE TRANSPOSITION OF VISCERA IN A CASE OF DIFFUSE APPENDICEAL PERITONITIS.

DR. EUGENE H. POOL presented a boy, 14 years old, an Austrian by birth, who was admitted to the New York Hospital on April 5, 1912. Several days prior to his admission, while working, he was seized with pain in the abdomen. This was not localized, and was somewhat gnawing in character. He went to bed, and in two days he was apparently free from pain. He then got up and chopped wood, when the pain recurred, followed by vomiting. He returned to bed, but the pain gradually grew worse and became localized in the lower part of the abdomen, being at first more severe in the left lower quadrant and later in the right lower quadrant. He had very little appetite; the bowels were

loose. Previous to his present illness the boy had always been healthy with the exception of an attack of measles.

On admission the abdomen was found markedly distended and tympanitic. There was general muscular rigidity, with marked tenderness in both lower quadrants, more pronounced on the right side. No masses could be made out. With the limbs alternately elevated, pressure exerted over the psoas muscle produced more severe pain on the right side than on the left. The liver dulness was apparently diminished. The boy was poorly nourished and looked ill, with lips slightly cyanotic. The diagnosis of diffuse peritonitis was made; the appendix was regarded as the probable cause, and immediate operation was decided upon and performed.

On the date of the operation, April 5, 1912, the boy's temperature was 102.4° F.; pulse, 112; leucocytes, 31,000; polymorphonuclears, 93 per cent. The abdomen was opened through an intermuscular incision in the right lower quadrant. On opening the peritoneum, considerable pus escaped under tension. The intestines were found to be quite extensively covered with fibrinous exudate. The appendix not being readily found, the wound was extended into the sheath of the right rectus muscle (Weir). The large intestine which presented was identified as sigmoid by the absence of ileum and its fixed position in the pelvis, where it appeared to become continuous with the rectum. Inspection of the hepatic region failed to disclose an undescended cæcum, and transposition of the viscera was suspected. Two fingers were passed transversely across the cavity, coming in contact with adhesions and a small mass on the left side. A second intermuscular incision was then made over this mass in the left quadrant one inch mesial to the left anterior superior spine on a line between the spine and the umbilicus. When the peritoneum was opened, the caput coli presented, and upon lifting the colon the appendix appeared. It was gangrenous and friable, so that its tip broke off on manipulation. It was thickly covered with fibrinous exudate, and at one point there was a perforation. The meso-appendix was ligated with catgut, a similar ligature was passed around the base of the appendix, and the appendix removed with the Paquelin cautery. While there were light adhesions in the neighborhood of the appendix, there was free pus under tension in the right iliac fossa, upward toward

the liver, and to a lesser degree in the pelvis. Both wounds were closed, with cigarette drainage. There was considerable shock. The post-operative course was somewhat protracted by suppuration of both wounds, but otherwise the patient's convalescence was uneventful. Physical examination and X-ray photographs indicated complete transposition of the thoracic and abdominal viscera.

The patient was examined on May 29 by Dr. Hughes Dayton, of the New York Hospital, who reported that the heart apex beat was behind the fifth right rib, 6.5 cm. from the median line; cardiac dulness extended upward to the third right rib; its left border was 3 cm. to the left of the median line; its right border 5 cm. to the right of the median line in the third intercostal space; 7.5 cm. to the right in the fourth. The lungs were normal in every respect. Splenic dulness: upper border at seventh rib; anterior border 1 cm. posterior to a line joining the right sterno-clavicular articulation and the tip of the eleventh right rib. The liver dulness extended from the fifth left rib to 1 cm. above the left costal margin; its edge could not be felt.

The use of the X-ray with bismuth enabled the position of the stomach and large intestine to be quite accurately mapped out. The long axis of the stomach lay from right to left; the cæcum and ascending colon lay on the left side, and the descending colon and sigmoid on the right side. The larger lobe of the liver lay on the left side.

Dr. Pool said that in 1906 Sorge published a comprehensive article on *situs viscerum inversus* in which he discussed the hypotheses as to its etiology, and gave a list, with references, of 194 cases of total transposition of the abdominal viscera. A few cases had been reported since then, Hollenbach, in 1906, mentioning six cases, exclusive of that reported by Mühsam. Two of these recent cases were of particular interest by reason of the fact that one was operated on for acute appendicitis (Mühsam), and the other for chronic appendicitis (Hollenbach).

BILATERAL FEMORAL ADENOLYMPHOCELE (FILARIAL).

Dr. H. H. M. Lyle presented a negro from St. Kitts, West Indies, 21 years old, who came to this country two years ago. Four years ago he first noticed a small lump in each groin; the swellings were soft, painless, disappearing on lying down and

reappearing on standing. During this time he also suffered from periodical monthly attacks of pain in the lower abdomen; these attacks, which persisted for from 24 to 48 hours, were always ushered in by a violent chill and high fever, and terminated in a general, profuse perspiration. During one of these attacks the patient was operated on for acute appendicitis in some hospital in New York City. He obtained no relief from the removal of his appendix. There was no history of chyluria. The periodicity of the attacks had led to the diagnosis of malaria, the attacks of abdominal pain had suggested the diagnosis of appendicitis, diverticulitis, etc. Later, with greater prominence of the femoral swellings, diagnoses of femoral hernia and strangulated femoral hernia were made. The patient was thereupon referred to St. Luke's Hospital with the diagnosis of double femoral hernia.

Examination on admission showed that the regions of the triangles of Scarpa were occupied by soft, doughy, obscurely lobulated swellings. These masses were fixed to the deeper tissues, the skin being movable over them. On assuming the prone position the swellings slowly diminished in size, but did not completely disappear; there was no gurgle, and they returned on standing. Pressure over the inguinal and femoral rings did not control the swellings; there was an impulse on coughing. There was an indefinite mass in the lower abdomen. The urine showed nothing abnormal. The blood contained 800 white blood-cells, with 70 per cent. of polynuclears; eosinophiles, 4 per cent.; large mononuclear lymphocytes, 8 per cent.; small lymphocytes, 18 per cent.; hæmoglobin, 70 per cent.; red blood-cells, 4,000,000. Microfilaria were found in the blood. Both the Wassermann and luetin tests were negative.

The diagnosis of adenolymphocele was made, and the glandular masses in both groins excised. The glands were enlarged, soft, and distended by a pink, milky fluid, which coagulated quickly. The lymphatics were greatly enlarged. A uterine sound passed quite readily into the lumen of the larger trunks of lymphatics, which extended through the femoral ring into the abdomen. It was found necessary to tie and cauterize these connecting lymphatics in order to check the escape of the fluid. The wounds healed by primary union, and there was no resulting lymphorrhœa nor elephantiasis. Attempts to destroy the microfilaria by injections of neosalvarsan had failed.

Dr. Lyle said his object in presenting this case was to emphasize the possibility of a mistake in diagnosis, and to learn if any one present had had any experience in methods aimed at killing the parent worms. He questioned whether it would be wise to inject a substance like salvarsan or thymol directly into one of the large lymphatics in the hope of reaching the parent worms. Upon looking up the subject more thoroughly, he found that the best practice was to avoid operating in these cases. If we regarded the process as a retrodilatation of the abdominal lymphatics, in their endeavor to form a collateral circulation which would overcome the obstruction, then by operating we were doing the patient an active harm, beside subjecting him to the risks of infection, lymphorrhœa, and elephantiasis. In the event of the latter developing in the limbs, it would be possible to anastomose one of the large lymphatics to a suitable vein. This had already been done by Godlee of London.

RUPTURE OF THE LIVER.

Dr. Burton J. Lee presented a man, 35 years old, who was admitted to Bellevue Hospital, in the service of Dr. John A. Hartwell, on August 18, 1912. The history obtained was that the man had been drinking heavily for the past four weeks, and that on the night of his admission he had jumped from a second-story window, landing in the basement. He was brought to the hospital in an ambulance, and admitted to the alcoholic ward. Upon admission, in addition to a jagged scar in the middle of the forehead, the abdomen was found to be very tense over the entire right side, with tenderness over the right hypochondrium. There were no contusions over the abdomen. During the night the patient complained of very severe pain in the right abdomen, and the rigidity and tenderness became more marked. There were no signs of fluid in the abdomen.

When Dr. Lee saw the patient, on the following day, there was rigidity and tenderness over the entire right abdomen, more marked in the upper quadrant. There was dulness on percussion in the right flank. An immediate operation was done, the incision being made over the outer border of the right rectus. The peritoneal cavity was found to contain a considerable quantity of free fluid, resembling a mixture of bile and blood. After washing out the cavity, the liver was examined, and a small

rupture was found. This was situated in the right lobe and extended transversely just above the fossa, for the gall-bladder, running upward and to the left for about 1½ inches. It did not seem sufficiently extensive to account for the large quantity of bile that had escaped, so a rupture of one of the ducts was sought, but none found. The rupture in the liver was thereupon sutured, with a large round needle and No. 2 catgut, in a single mattress suture, and the wound partially closed, a cigarette drain being placed down to the suture line in the liver, and a second similar drain to the region of the common bile-duct. The man made an uneventful recovery, and left the hospital on September 20, 1912. The wound had healed with the exception of a small sinus, which was still discharging a slight quantity of biliary fluid.

RUPTURE OF THE BRACHIAL ARTERY AND MUSCULOSPIRAL NERVE, WITHOUT FRACTURE OF THE HUMERUS.

Dr. Lee presented a girl, eight years old, who was admitted to Bellevue Hospital, in the service of Dr. Hartwell, on September 15, 1912. The history she gave was that five days before admission, while walking along the curb, she was struck by the rear wheel of a passing ice-wagon, and her right arm was either run over or caught between the spokes. She was taken to a hospital, where an amputation was advised, but the parents refused to give their permission and the girl was brought to Bellevue Hospital.

Upon admission, an examination showed extensive abrasions and contusions on the inner and anterior aspects of the right arm, extending from above the elbow to above the wrist. There was considerable swelling of the limb. The right hand was slightly colder than the left; there was no cyanosis; the radial pulse and the ulnar pulse were not palpable. There was drop-wrist, and it was believed that the musculospiral nerve had been ruptured or seriously injured. A careful examination for sensory disturbance was not made at first. A recent examination shows some slight return of sensation, and a beginning slight return of power of extension at the wrist-joint. There were no evidences of fracture, and X-ray examination confirmed this finding.

Dr. Arthur L. Fisk said that some years ago he showed to the Society a patient, a plumber's helper, who had been struck on the shoulder by a section of soil-pipe which fell three stories,

producing a complete rupture of the subclavian artery and of the brachial plexus of nerves. There was no fracture of the clavicle, scapula or ribs in this case. Dr. Fisk cut down on the vessel and nerves; sutured together the ends of the brachial plexus, but did nothing to the subclavian artery. Gangrene of the arm finally occurred, which compelled amputation at the shoulder-joint.

Another case, which he saw when an interne at the Massachusetts General Hospital, was a brakeman, who weighed about 250 pounds, who missed his footing when he was climbing up between two freight cars of a moving train. He fell between the cars to the roadbed with his thighs lying across the rail; the forward truck of the following car passed over both thighs. The only external evidence of injury was a long oblique skin tear of the left thigh. On examination it was found that all of the soft tissues beneath the skin had been crushed completely through to the bone, but that neither of the femurs was broken. The patient died of shock within a few hours.

NON-ROTATION OF THE INTESTINE; ITS RELATION TO HIGH RETROCÆCAL AND ABERRANT POSITION OF THE APPENDIX.

Dr. Arthur S. Vosburgh read a paper with the above title.

Dr. Gerster said Dr. Vosburgh's paper recalled an experience of fully 25 years ago when he had a patient on the table at the German Hospital and was unable to find the appendix in the right iliac fossa. The intestines were very much distended, and a search for it was not easy. Finally, after considerable exploration which was not very beneficial to the patient, the appendix was found on the left side, very high up, in the vicinity of the lower pole of the spleen. It was perforated and gangrenous, and evidences of peritonitis had already developed, but the patient recovered.

Since then, Dr. Gerster said, he had met with this condition with comparative frequency, particularly the retrocæcal variety, and also cases where the appendix was located in the left side. By knowing or at least suspecting the true state of affairs beforehand, we were prearmed. Otherwise, it puzzled the surgeon in his approach, and complications might arise in consequence of this abnormal site of the appendix and cæcum. As bearing on this general subject, the speaker said he had recently published

the report of a case where a young girl was admitted to the hospital with the diagnosis of acute pyelonephritis of the right kidney. She was vomiting, complained of excruciating pain in the region of the right kidney, which was aggravated by pressure, and the urine contained pus. The X-rays failed to reveal the presence of a calculus. Although the symptoms pointed to a pyelonephritis, the diagnosis was not positive, and Dr. Gerster decided to make an exploratory incision on the right side. The gall-bladder was found to be normal, and a rather cursory examination of the pelvis on that side gave no definite results. This wound was then closed and an incision made over the right kidney, which was found much congested. It was drained, and although the patient improved somewhat after this procedure, the fever still persisted and her pain did not entirely disappear. Finally, the drainage showed that the kidney was the seat of a mixed infection and it was removed. For a time after this she did very well; then the old pains recurred and the speaker began to suspect that the seat of the trouble was not extraperitoneal but within the peritoneum. He again went in through the old kidney incision and found an undescended cæcum and an appendix that was very much swollen and in a state of empyema. This appendix was closely adherent to that part of the posterior parietal peritoneum which lay directly against the pelvis of the right kidney. Infection of the renal pelvis had taken place and was maintained by osmosis through contiguity. The appendix was extirpated and the patient was cured, but with the unnecessary loss of one of her kidneys.

Dr. George E. Brewer said he was very glad to hear this instructive class of cases under discussion. During the past summer he saw a case of the type that had been referred to as non-rotation of the intestine. The patient had all the classical signs of appendicitis, but the appendix could not be found in its usual location, and upon extending the incision upward, the descending colon could not be found in the right half of the abdomen, which was filled with intestine. He thereupon again extended the incision and found the colon and cæcum in the midline, while the appendix itself was found in the same location adherent to the floor of the pelvis.

Dr. Brewer said that in another case of acute appendicitis he found an unrotated cæcum. While these were puzzling cases,

they were not as difficult to handle as the type of case which Dr. Vosburgh had referred to as the retrocolic appendix. The speaker said he had seen at least five such cases during the past six months. They were exceedingly difficult to handle, and even extension of the ordinary gridiron incision toward the midline did not help very much. In this type of cases, Dr. Brewer said, he had made use of the Kammerer incision.

Dr. N. W. Green said the paper of Dr. Vosburgh helped to explain a case which he recently operated upon at the City Hospital, in the service of Dr. Howard Collins, which he had found rather puzzling, as the abdominal symptoms were entirely transposed, the pain, tenderness and rigidity being on the left side. Upon opening the abdomen, a very long mesocolon and mesocæcum was found, which had allowed the appendix to lie over on the left side.

Referring to the suggestion made by Dr. Meyer that in some of these cases the appendix could best be reached by making an incision parallel to the crest of the ileum, Dr. Green said he had had four such undescended cases in the past eighteen months, in two of which the diagnosis of the position was made prior to operation. In one case where the appendix could not be reached through the usual incision, he made a transverse incision opposite the umbilicus, separating the external and internal oblique and transversalis fibres, and pulling the rectus toward the midline, thus getting a very good exposure. He had also followed this method in two other cases. The fourth case, before operating, had been looked upon as one of duodenal ulcer.

Dr. Arthur L. Fisk said that in obscurely placed appendices he has found the procedure of rolling the caput coil between the fingers and thumb—similar to that passing the scrotum between them in examining the vas deferens—of great assistance in locating the appendix, which can be felt as a round cord. Where the appendix is behind the ascending colon, incision of the parietal peritoneum along the outer side of this, then freeing the caput and colon and drawing them toward the middle line, will give access to the appendix.

BOOK REVIEWS

HARELIP AND CLEFT PALATE, with special reference to the operative treatment and its results, by JAMES BERRY, B.S., F.R.C.S., Senior Surgeon to the Royal Free Hospital, London, and T. PERCY LEGG, M.S., F.R.C.S., Surgeon to the Royal Free Hospital, London. 324 pages, 242 figures. Philadelphia, P. Blakiston's Son & Co., 1912.

This book is a model of what a surgical monograph should be. Reviewers of some books may reach their conclusions from a cursory reading; but in this instance the attention has been compelled from start to finish. The clearness, definiteness, and modesty of the diction, the beauty, instructiveness, and recognizable fidelity of the illustrations, the logical sequence of chapters, and the appendix of results of cleft-palate operations make the reader devour page after page with an avidity similar to that of a consumer of a best seller in romance.

In the early chapters are discussed the development of the lips and palate, and the anatomy and physiology of these structures. Then follow descriptions of the varieties of congenital clefts in lips and palate, and the functional results of the fissured palate, with a valuable discourse on the effects of the palatal defect on the pronunciation of consonants.

Next the authors describe their methods of operating on these natal defects, add the details of after-treatment, and tell what may be necessary in the domain of secondary operations and in the training of the cleft-palate child to speak normally after the operative closure. For most surgeons the chief interest will be found in these statements concerning the management of cleft-palate cases.

In later chapters appear accounts of other methods of operating for palatal fissures than their own, with the estimate of the value of these procedures, which the authors have reached, and a description of the mechanical substitutes for the palate which are occasionally used. They give an excellent account of Brophy's osteoplastic operation for wiring the cleft palate in

very young infants; but they appear not to have employed it. In truth, their own method, which is practically a modified and improved Langenbeck operation, has been so successful that little temptation has existed to abandon it. Moreover, they evidently prefer not to operate on the recently born infant, in which only is Brophy's "tie-beam" method used by him.

Lane's "turn-over flap" operation for cleft palate is not recommended by them. The ultimate results have not yet been thoroughly presented to the profession, they say; although "it has been very widely adopted by some surgeons in this country" (Great Britain). The authors do not seem to have given this method much consideration; possibly because of the good results obtained by their accustomed procedure.

It is their habit to close the harelip before operating on an accompanying fissure of the palate. The lip operation is done within the first few weeks of life, unless the infant needs its nutrition improved by careful feeding for a longer period. The correction of the palatal defect is delayed for a year or two. By that time the marginal borders of any fissure in the alveolar arch, if it originally was cleft, are apt to be nearly or quite in contact. This circumstance greatly lessens the surgical problem of making a complete roof to the mouth.

It is refreshing to find that the authors have not depicted the multitude of geometric figures which, to the confusion of the reader, are often seen in articles on labial fissure. Most of them are historical rubbish. It is the custom of Drs. Berry and Legg to preserve, whenever possible, the premaxillary bones when closing double harelip complicated with even marked projection of these processes.

As indicated in the first paragraph of this review, the book is an unusually satisfactory monograph both in literary style and in surgical comprehensiveness. The former merit is probbly due to the early training required to obtain the academic degrees possessed by the authors; the latter to wide experience in operative treatment, joined to logical minds and facile pens. The only deficiency that the reviewer has observed from a surgical point of view is a lack of full discussion of the very wide clefts of the palate and lip, often double, with great projection of the premaxillary bones. These often baffle a surgeon's efforts. Perhaps postponing the uranoplasty until the

second, third, or fourth year of life makes the gap narrower and more amenable to operative cure; or it may be that such infants die before the authors of this work are ready to accept them for operation. Surely this complicated deformity must occur in Great Britain as it does in America, where it is the despair of many surgeons.

A few slips of the pen have been noticed. "Either" is a poor substitute for "each" (page 131), though King James's Version may justify such use; "the last" would be better than "the latter" on page 181, though Shakespeare may be quoted in defence of the latter; "let alone" is evidently meant on page 162 where the authors have written "left alone." Perusal of their book causes one to long for personal acquaintance with writers who are able to add such a valuable contribution to surgical literature.

JOHN B. ROBERTS.

THE COLLECTED WORKS OF CHRISTIAN FENGER, M.D., edited by LUDWIG HEKTOEN, M.D., Professor of Pathology at Rush Medical College; two octavo volumes, each 525 pages, illustrated. W. B. Saunders Company, Philadelphia and London.

These two volumes form an excellent memorial of their author, who was both a great surgeon and teacher. Dr. Fenger had the rare opportunity of being a pioneer in introducing into the Northwest surgery based on pathology. He came to Chicago in 1877 with the prestige which attached to him from his former position as Docent in Pathology in the University of Copenhagen, and as former Prosector of the Commune Hospital of that city. He had the advantage, also, of having settled in a city in which the number of citizens of Scandinavian descent was very large. The result of these conditions was that his native abilities enabled him to rapidly obtain a position of eminence and of great influence among the surgeons of the Northwest, and during his lifetime, in any list of eminent surgeons of Chicago, the name of Christian Fenger would be found at its head.

He had a peculiar, hesitating, stammering manner in attempts at public speech, which hampered him very much in the lecture-room, but the extent of his knowledge, the soundness of his judgment, and his personal amiability more than compensated for any such superficial drawback. He possessed what no other

surgeon in the Northwest did have at the time of his advent, namely, a thorough knowledge of surgical pathology. The surgeons of that day who had attained eminence were clinicians and brilliant technicians, and none better than they appreciated their own defects in the newer pathology, and by none more than by them was the pathological surgery of their Danish *confrère* appreciated.

In the present volumes are collected the various papers which were published by Dr. Fenger during his active career as a surgeon, extending from 1878 to 1902. They are of especial value as examples of the work which characterized the progressive surgeons of the last quarter of the nineteenth century, in which the new pathological doctrines founded primarily upon the teaching of Virchow, and the new clinical methods founded upon the teaching of Lister united to create a new surgery.

The first volume has, as a frontispiece, a very excellent portrait of Fenger, and is introduced by an all too brief autobiographical note.

LEWIS S. PILCHER.

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A Monthly Review of Surgical Science and Practice.

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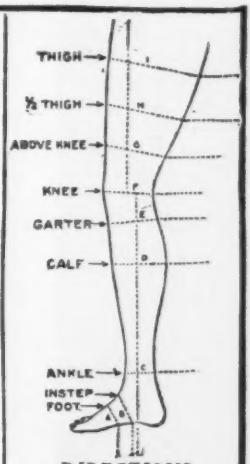

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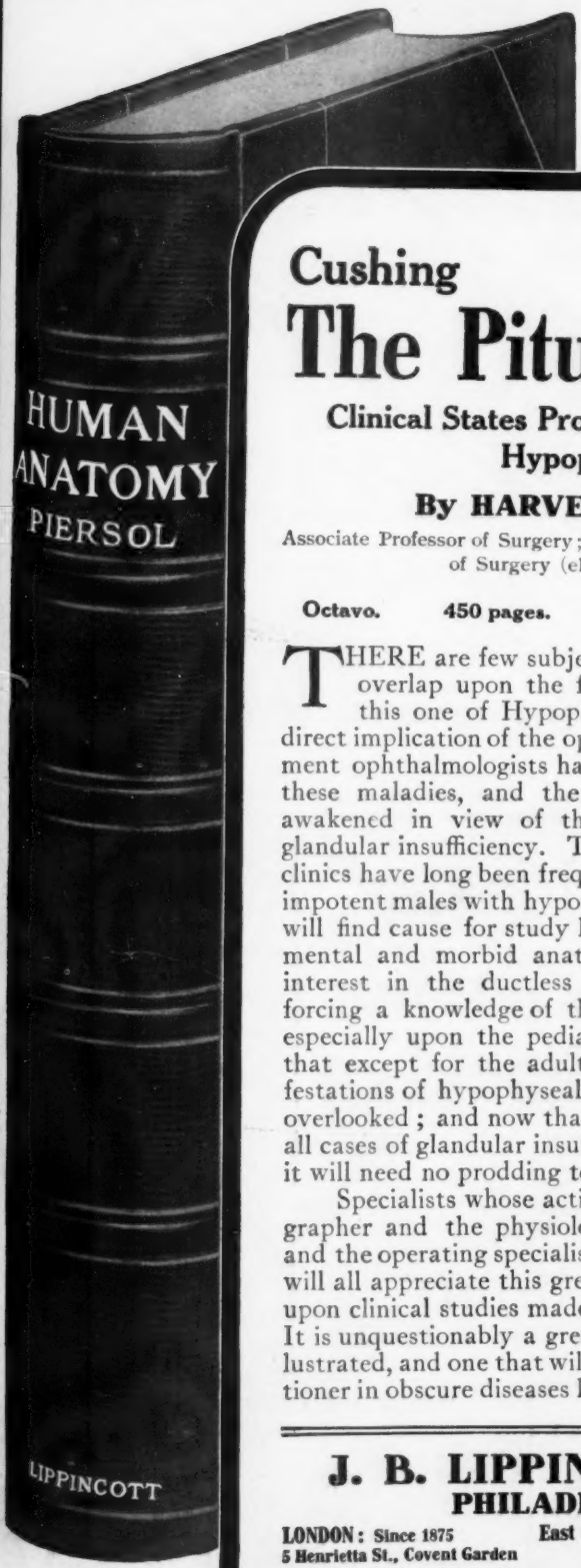

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THE ICE BAG IN APPENDICITIS.

In a most interesting article by A. M. Fauntleroy, Surgeon of the United States Navy, Medical Records, Aug. 3, 1912, the fact is brought out, basing the same upon a large number of cases of appendicitis operated, that the ice bag is positively harmful in this condition. In 50% of the cases operated, where the ice bag was used, the condition seemed to indicate that there was a noticeable lack of effort on the part of nature to wall off, from the rest of the abdominal cavity, the appendix, which was frequently very much congested, gangrenous or perforated. He also observed that in the ice bag cases there was a surprisingly low white cell count when one took into consideration the condition found in the abdomen at the time of the operation. From 8,000 to 11,000 white cells was the rule in these ice bag cases when one would be justified in saying that the pathological condition warranted a constitutional reaction of from 20,000 to 30,000 leucocytes, or even higher.

On the other hand in these cases in which the hot-water bag or morphine had been used prior to operation (the ice bag not being used at all), the white count corresponded to what one would expect. Dr. Fauntleroy advances from his findings the logic that while the ice bag causes numbness, practically the same as in the condition of frost-bitten ear or toe, it also decreases hyperemia, leucocytosis and stasis in the part to which it is applied. That heat is the direct antithesis of cold inflammatory processes, whether superficial or peritoneal, seems to be from his report most logically and conclusively proven.

In applying heat whether it be for peritoneal or inflammatory conditions of a more superficial character, the most rational method is to use that which is not only sanitary, but, for the comfort of the patient does not require frequent changes. In this respect, antiphlogistine, on account of its heat retentive properties, its cleanliness, and its ease of application, should appeal to the professional mind. That antiphlogistine has proven of great therapeutic value as a thermic agent is best indicated by its extensive professional employment, and its many advantages over the hot-water bottle and other methods of application of heat is readily discernible.

THE RECALL.

A correspondent wants to know who first favored the Recall. We are not certain, but we are inclined to believe it was Adam and Eve. —*December Lippincott's*

IF THE TAPE-WORM COULD TALK.

If the tape-worm could only talk he would refer sarcastically to many preparations of male-fern now dispensed. Designed for his eviction, countless doses have been impotent against him; and despite them all, he continued to remain, as ever, on the premises—very much alive.

But Taenicide (Abbott) spells his finish. It's the one male-fern preparation which he fears and cannot hold out against.

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Croton oil.....mins. 4
Castor oil, to make.....oz. 2

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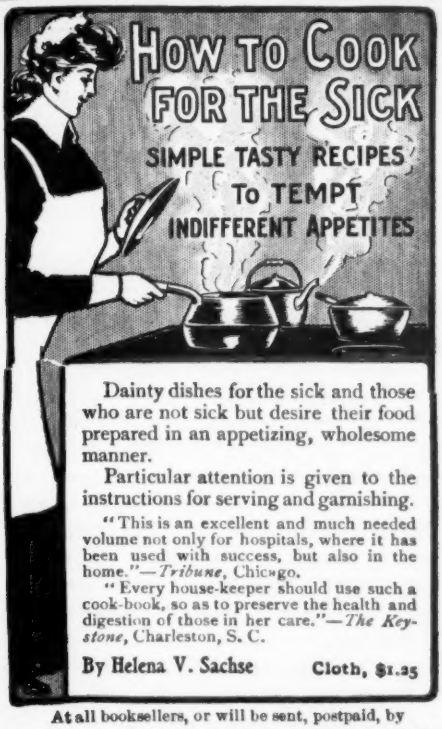
The doctor who needs (and every doctor does quite frequently) will find this preparation to do exactly what it is intended to do. Send for a circular.

THERAP.

There is always a great and lasting satisfaction to be derived from administering a remedy and obtaining the result desired and expected. Aside from the therapeutic and more or less material benefits, the gain in medical confidence from standpoints of both practitioner and patient, is always considerable. Few remedies have given rise so consistently to the satisfaction of therapeutic dependability as Gray's Glycerine Tonic Comp. For a good many years thousands of physicians have been using this reliable tonic, with confidence born of almost invariable success, and to say that medicine and medical practice have been benefited and strengthened thereby is not only to state the truth, but to give deserved credit to a worthy product.



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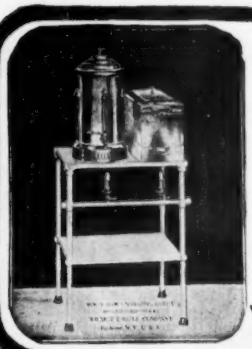

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GROWTH IN THE USE OF BACTERINS.

Treatment of infectious diseases with preparations derived from corresponding microorganisms is unquestionably growing in favor. Not only do the bacterial vaccines (or bacterins) seem destined to a permanent place in therapeutics, but their field of applicability is constantly broadening. Proof of this is seen in the growing list of these products announced by Parke, Davis & Co., no less than fifteen of the bacterins now being offered to the profession.

There are a number of reasons for the favor which is being accorded to the bacterial vaccines. In the first place these products are in consonance with the scientific trend of present-day medication. They are being used with a gratifying measure of success. The method in which they are marketed (sterile solutions in hermetically sealed bulbs and in graduated syringes ready for injection) appeals to the modern medical man, assuring, as it does, both safety and convenience. The moderate prices at which they may now be purchased will tend to give them still greater vogue. And these prices are worthy of note, since they represent a great reduction from those formerly prevailing, amounting, if we are not mistaken, to as much as 60 per cent. in many cases. They are announced elsewhere in this Journal over the signature of Parke, Davis & Co., and will repay a careful scrutiny.

CELL NUTRITION.

All classes of cells are made to live and perform their several functions by the phenomena of cell nutrition, and whenever mal-nutrition, intoxication, or other causes, impair the special function of cells, they do so by producing some intrinsic metabolic defect. Agents which will directly or indirectly repair metabolic defects are true cell tonics. A very large experience and a close and careful clinical study of all pathological conditions show conclusively that Bovinine is an ideal cell tonic and food. It stimulates the cells to healthy proliferation. It tones the newly born cell, giving it a full and normal power of absorbing, and immediately meets this demand by supplying a full and complete nutrition.

AT HIS UNCLE'S.

Bilton: "Well old man, are you going to hang up your socks this Christmas?"

Tilton: (sadly): "No; my dress-suit."

—*December Lippincott's*

A THERAPEUTIC REQUISITE FOR NEUROTIC PATIENTS.

There is never greater need for careful discrimination in the choice of remedial agents than in the case of neurotic subjects. As a result of perverted nervous function the moral fibre of such patients has become weakened in view of which the physician hesitates to order drugs whose use otherwise would be warranted.

It is in just such instances that Pasadyne is of the greatest usefulness. Pasadyne, as is now generally known, is a standard preparation of the Concentrated Tincture of Passiflora Incarnata, and possesses marked soothing and hypnotic properties. A further distinct advantage of Pasadyne lies in its freedom from the dangers attending the use of drugs producing similar effects. The physician giving it, although he may look for the same results following the use of chloral or the bromides, need not fear any disagreeable after-effects.

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A SEASONABLE REMINDER.

Urotropin in full doses (adults 15 grains, children 2-6 grains, three times per day), given in the early stages of a "cold" assisted by a mild saline laxative, is the modern method of "breaking it up," far preferable to and safer than quinine, phenacetin, acetanilid, etc.

Based upon its proven excretion by the mucous membranes of the entire respiratory tract, systemic Urotropin medication is also recommended as a routine measure in acute rhinitis, tonsillitis, catarrh, bronchitis, influenza and grippe.

This, however, is only one new field of usefulness of this most diffusible of drugs, which to many practitioners is still known only as a urinary antiseptic. Physicians, who have not yet received the new 20-page booklet on Urotropin recently published by Shering & Glatz, New York, can obtain a copy of the same by addressing the firm, mentioning this journal. It is the best and most convenient way to become posted on Urotropin therapy up-to-date.

EXPECTATIONS.

Hubby: "Well, the Christmas gift from your father came, but it was n't what you expected."

Wifey: "Oh, I expected it would n't be."

—*December Lippincott's*

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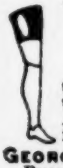

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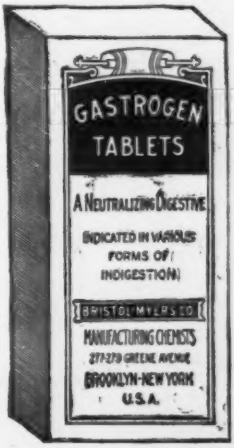

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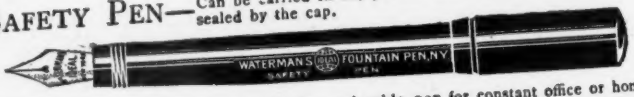

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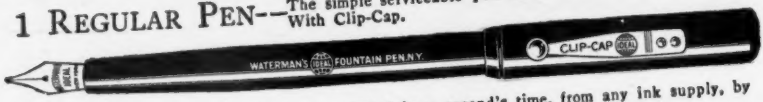

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